Volume 101
Number 3
2016

Annals
of the
Missouri
Botanical
Garden

A TAXONOMIC REVISION OF PHILIPPINE *MUSSAENDA* (RUBIACEAE, MUSSAENDEAE)[1]

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Abstract

The Philippine taxa of *Mussaenda* Burm. ex L. (Rubiaceae, Ixoroideae, Mussaendeae) are revised here, based on field observations and study of herbarium specimens. Twenty-four species and four varieties are recognized, with three new species and one new variety. In the Philippines, *M. grandibracteata* Alejandro is described from the province of Occidental Mindoro, *M. liedeae* Alejandro from Palawan, and *M. milleri* Elmer ex Alejandro from Nueva Ecija; *M. philippica* A. Rich var. *pubescens* Alejandro is described from Davao Oriental. A lectotype is newly designated for *M. benguetensis* Elmer, and the invalid name *M. milleri* is validated herein. *Mussaenda macrophylla* Wall. var. *grandisepala* (Jayaw.) Alejandro has new status for its rank as variety rather than form, and the epithet *grandisepala* is lectotypified. Subsequent lectotypifications are designated for *M. scandens* Elmer and *M. vidalii* Elmer. The morphology of Philippine *Mussaenda* is compared with Asian and African *Mussaenda* and is distinguished from other genera of Mussaendeae by its reduplicate-valvate corolla aestivation. The forms of trichomes and morphology of the calyx and corolla are valuable characters for species recognition. Variation of trichomes inside the corolla exists between the short- and long-styled flower morphs and is an important character in recognizing some Philippine *Mussaenda*.

Key words: IUCN Red List, Ixoroideae, *Mussaenda*, Mussaendeae, Philippines, Rubiaceae, subsequent lectotypification.

Mussaenda Burm. ex L. (Rubiaceae, Ixoroideae, Mussaendeae) is a widely accepted genus ranging from shrubs to small trees, scandent shrubs, lianas, or rarely, suffrutices. The genus as currently delimited (sensu Alejandro et al., 2005) is mostly paleotropical, comprising ca. 135 species distributed throughout the moist tropics of Asia with ca. 100 species and in Africa with ca. 35 species (Bridson & Verdcourt, 1988). *Mussaenda* is the most widespread and species-rich genus of the seven genera within the Mussaendeae (Bremer & Thulin, 1998; Bremer et al., 1999; Rova et al., 2002), with the other six being

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[1] We thank Victoria C. Hollowell and Charlotte Taylor for their helpful comments, suggestions, and meticulous editing on an earlier version of this paper; Maryjane Hotaling for checking authors names and references; the following herbaria and their staff for providing loans and/or access to collections: A, BM, BR, L, MO, NY, P, PNH, US, and WAG. The first author thanks Colin Ridsdale for generously sharing his knowledge of the Philippine Rubiaceae; Irma Mika for the Latin translations; Nemecio Diego for his illustrations; John Cris Castro for assistance during fieldwork; and Domingo Madulid of the PNH for arranging collecting permits in the Philippines. This work was funded by the University of Santo Tomas – RCNAS, Manila, Philippines; Department of Plant Systematics, University of Bayreuth, Bayreuth, Germany; Deutscher Akademischer Austauschdienst (DAAD); the Alexander von Humboldt (AVH) Foundation; and CHED-Philippine Higher Education Research Network (PHERNet).

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doi: 10.3417/2010089

Ann. Missouri Bot. Gard. 101: 457–524. Published on 27 April 2016.

Bremeria Razafim. & Alejandro (28 species, including *B. pervillei* (Wernham) Razafim. & Alejandro from Madagascar), *Heinsia* DC. (four or five species, including *H. crinita* (Afzel.) G. Taylor), *Landiopsis* Capuron ex Bosser (monotypic), *Neomussaenda* Tange (two species), *Pseudomussaenda* Wernham (four or five species), and *Schizomussaenda* H. L. Li (two species) (Alejandro et al., 2005). *Mussaenda* is characterized by enlarged calyx lobes or calycophylls (sensu Delprete, 1996), indehiscent fruits, containing numerous small, reticulate seeds. Among Mussaendeae, *Mussaenda* is distinguished by its reduplicate-valvate corolla aestivation (Alejandro et al., 2005; 2008). Both morphology (Puff et al., 1993) and molecular data (ITS and *trnT-F*) (Alejandro et al., 2005) support a sister relationship between *Mussaenda* and *Pseudomussaenda*, but the latter is distinct by its induplicate-valvate aestivation and capsular fruits (Wernham, 1916). Although there is no morphological synapomorphy for the *Mussaenda–Pseudomussaenda* group, these taxa are characterized by smaller corollas less than 5 cm, compared to its sister *Bremeria–Landiopsis* group, with larger corollas greater than 5 cm (Alejandro et al., 2005).

Many species of *Mussaenda* are cultivated in botanical gardens all over the world because of their resilience and long blooming period throughout almost the entire year. The discovery of *M. philippica* A. Rich var. *aurorae* Sulit (with all five calyx lobes enlarged) then crossed with the African *M. erythrophylla* Schumach. & Thonn., which led to the development and propagation of ca. 20 Philippine hybrids (Rosario, 1998) that are known for their splendid and iridescent, enlarged calyx lobes.

Merrill (1923) enumerated 18 species of *Mussaenda* native to the Philippines. Later, Jayaweera (1964) published a herbarium-based study that included 19 species, one variety, and one form. For species recognition, Jayaweera emphasized the number and distribution of stipule colleters and the size and number of perforations on the inner tangential walls of the seed exotesta cells. However, these characters are labile, varying even within a species. Recent evaluation showed that other features such as the vegetative character of the external indumentum and the reproductive character of corolla trichomes mentioned by Jayaweera (1964) to be inaccurate. The Philippine *Mussaenda* comprise species of trees or shrubs, rarely scandent, that thrive in a variety of habitats such as coastal scrubs and thickets, disturbed roadsides, ravines, riversides and stream banks, secondary and primary forests, savanna, and lowland or montane forests. Additional taxonomically useful characters have proved to be the corolla indumentum of both the short- and long-styled morphs of the flower, seed exotesta cells, and pollen.

METHODS

A taxonomic revision of the Philippine *Mussaenda* is presented herein as part of an ongoing project on Philippine Rubiaceae (Alejandro & Liede, 2003). This was based on the examination of over 600 herbarium specimens from A, BM, BR, L, MO, NY, P, PNH, US, and WAG (abbreviations after Holmgren et al., 1990), and on field studies (2002, 2003, 2010) on 20 of the 28 taxa of Philippine *Mussaenda* recognized here (cf. Appendices 1 and 2). Measurements of flowers and fruits are based mostly on collections preserved in 70% ethanol (Radford et al., 1973). For the few species for which no liquid material was available, measurements are based on rehydrated structures, using distilled water of Pohl's solution (Pohl, 1965).

Seeds were placed in an ultrasonic cleaner (30 min.; distilled water) in order to remove the outer tangential walls of exotesta cells. Pollen grains obtained from our collections were prepared by the acetolysis method (Erdtman, 1943). For SEM (Philips XL-30; Philips, Amsterdam, The Netherlands) investigations, prepared specimens were dehydrated in an ethanol series and formaldehyde dimethyl acetal (FDA) and subsequently critical point-dried. Dried samples were mounted on aluminum stubs, which were covered with polyvinyl acetate (PVA) glue and then sputter-coated with gold.

The data for each species were initially gathered against a character list, which encompassed over 200 characters used to generate a natural language description in DELTA format (Dallwitz et al., 1999) and then edited. In the taxonomic treatment, the summarized morphological characters of *Mussaenda* are based exclusively on the Philippine species. The local names, gathered through interviews and labels from herbarium specimens, are given for each species with the standard abbreviation of local dialects (Madulid, 2001) in parentheses.

MORPHOLOGY OF THE PHILIPPINE *MUSSAENDA*

HABIT

Plants of *Mussaenda* are terrestrial, woody, and usually shrubs (erect or scandent) to small- or medium-sized trees, but rarely true lianas and suffrutices (Asian *M. uniflora* Wall. ex G. Don and *M. parva* Wall. ex G. Don). The Philippine species are at the most 8 m high (e.g., *M. benguetensis* Elmer, *M. multibracteata* Merr., and *M. pinatubensis* Elmer), while some African *Mussaenda* can reach 9 m in height or more (e.g., *M. elegans* Schumach. & Thonn., *M. microdonta* Wernham, and *M. monticola* K. Krause). Three Philippine species tend toward becoming scandent or climbing shrubs (*M. macrophylla* Wall. var. *brevipilosa* Jayaw., *M. scandens* Elmer, and *M. vidalii* Elmer). Scandent or climbing shrubs are also found in *Heinsia* and *Pseudomussaenda*, whereas other Mussaendeae genera (*Bremeria*, *Landiopsis*, *Neomussaenda*, and *Schizomussaenda*) are typically erect shrubs or trees. The stems of *Mussaenda* are generally pubescent when young, becoming glabrescent. Lateral branches are more or less plagiotropic (except in lianas and suffrutices); mature stems are more or less cylindrical, lenticellate, and their bark can be easily peeled. Young branches are somewhat flattened and usually covered with a whitish or brownish to red indumentum. The external indumentum, which extends to the stipules and inflorescences, is of the cylindrical type, pluricellular, with few (< 12) or many (> 12) cells (cf. Robbrecht, 1988: fig. 19F). The various types of indumentum are useful in recognizing some Philippine species of which more than half are hirsute (e.g., *M. anisophylla* S. Vidal and *M. vidalii*). Indument varies from pilose (*M. chlorantha* Merr., *M. nervosa* Elmer, and *M. palawanensis* Merr.) or glabrous to puberulous (*M. philippica* var. *philippica*, *M. pinatubensis*, *M. scandens*, and *M. grandibracteata* Alejandro), and rarely velvety (only in *M. grandifolia* Elmer). The reddish brown indumentum on both vegetative and reproductive parts of *M. milleri* Elmer ex Alejandro is a diagnostic feature of the species.

LEAVES

Mussaenda leaves are opposite and decussate and generally coriaceous to membranaceous. Leaf arrangement seems consistent within a species, although leaves may show a trend toward anisophylly. All Philippine species are usually petiolate, though they may rarely be subsessile, with the petiole varying from 0.3 to 8 cm. The petioles are usually hairy except for those in *M. grandibracteata* and occasionally in *M. macrophylla* var. *brevipilosa*. Leaf blades vary from ovate, or elliptic, rarely obovate to orbicular. In the Philippine species, leaf blades range from small to relatively large (3.5–34 × 1.8–16.5 cm). Most species possess medium-sized blades varying from 10 to 25 cm (e.g., *M. acuminatissima* Merr., *M. attenuifolia* Elmer, and *M. ustii* Alejandro). Larger leaf blades reaching lengths to 34 cm are found in *M. anisophylla*, *M. grandifolia*, *M. lanata* C. B. Rob., and *M. multibracteata*, while lengths of less than 15 cm occur in *M. benguetensis*, *M. milleri*, *M. scandens*, and *M. pinatubensis*. Small leaf blades (3.5–12 × 1.8–4 cm) distinguish *M. pinatubensis*. Leaf blades are usually hairy on both sides, especially along the midrib and secondary nerves abaxially. Typically, terminal leaves supporting the inflorescence are smaller, with a denser indumentum, and often subsessile. Leaf apices are usually acute, or acuminate to subcaudate, the acumen extending from 0.5 to 1.5 cm. Three species show a rare conduplicate apex (*M. nervosa*, *M. philippica* var. *pubescens* Alejandro, and *M. scandens*). Leaf bases are usually cuneate or attenuate but may vary from obtuse to acute. The midrib and secondary veins are very prominent abaxially and usually prominulous adaxially. Only *M. nervosa* has a blade midrib and secondary veins that are distinctly sunken adaxially. The secondary veins are generally brochidodromous. Domatia, almost universally present in woody Rubiaceae, are entirely lacking in *Mussaenda* as well as in the rest of Mussaendeae.

STIPULES

The stipules of Mussaendeae are interpetiolar, triangular, typically bifid (halfway to almost near the base), rarely entire, and opposite pairs are sometimes basally fused, forming a ring around the node. In the Philippine species of *Mussaenda*, bifurcation of stipules is at the most slightly diverging or rarely prominently diverging as distinctively exhibited by *M. benguetensis*. Both surfaces of the stipules are usually more or less densely indumented. The distribution of trichomes adaxially varies from all over the whole surface to only restricted to the base and/or apex, leaving the middle portion glabrous (e.g., *M. benguetensis*, *M. lanata*, and *M. vidalii*).

COLLETERS

Mussaendeae colleters are present on the adaxial surfaces of both stipules and calyx lobes. The stipular colleters vary, occurring either in groups of two (Fig. 1A) or in a continuous band at the base (Fig. 1B). In Philippine *Mussaenda*, paired groups of colleters predominate, but variation sometimes exists even on the same branch. Colleters are usually found between sinuses of the calyx lobes as in many Gentianales. In the Philippine species, calyx colleters are small and typically solitary or in a group of two to five, rarely occurring in a row at the base of calyx lobes (*M. benguetensis*). Colleter number is not a reliable character because this may vary even among individual lobes of the same flower, as is the case in other Mussaendeae. In some *Bremeria* species, the colleters are distributed along the calyx margins

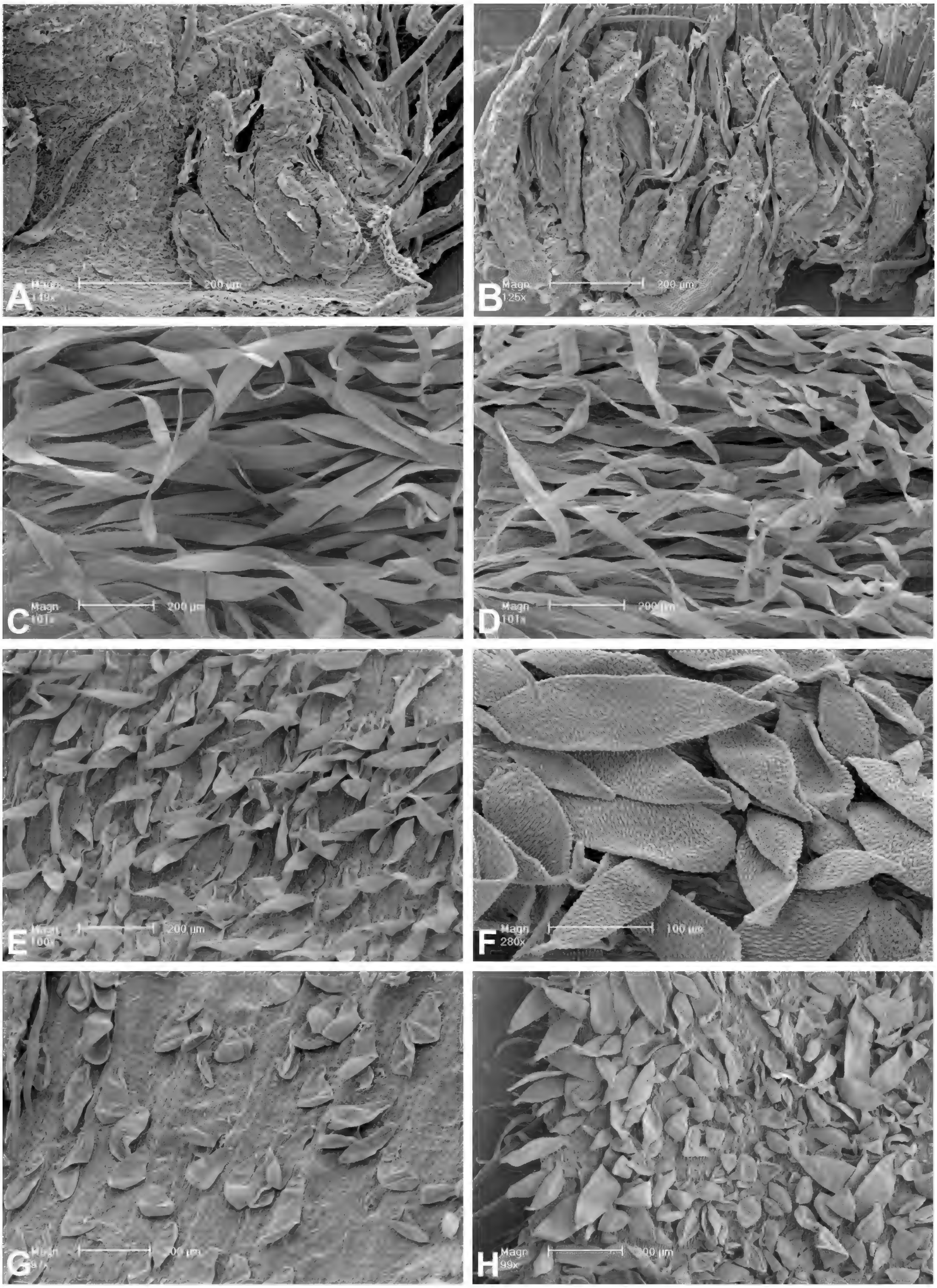

Figure 1. A, B. Distribution of colleters on the adaxial side of stipules in *Mussaenda* Burm. ex L. —A. *Mussaenda benguetensis* Elmer. Colleters in groups of two, with one isolated group shown. —B. *Mussaenda scandens* Elmer. Colleters in continuous band. C–H. Variations of unicellular trichomes inside the corolla. —C. *Mussaenda liedeae* Alejandro. Long, ribbon-like, unstriate trichomes densely distributed inside the corolla in short-styled flower morphs. —D. *Mussaenda albiflora* Merr. Long, ribbon-like, unstriate trichomes densely distributed inside the corolla in short-styled flower morphs. —E. *Mussaenda albiflora* Merr. Ribbon-like trichomes sparsely distributed in long-styled flower morphs. —F. *Mussaenda benguetensis* Elmer.

extending to almost half of the lobes (e.g., *B. vestita* (Baker) Razafim. & Alejandro).

INFLORESCENCES

The inflorescences of *Mussaenda* are typically terminal but may be displaced to pseudoaxillary (Robbrecht, 1988). These are cymose corymbs, congested or spreading, with few to many flowers, or rarely reduced to a single flower (*M. uniflora*). Based on the four types of development and specialization of pseudanthia recognized by Claßen (1984), the calycophyllous type characterized by the presence of enlarged calyx lobes occurs in *Mussaenda*. The inflorescence axes of both *Mussaenda* and *Pseudomussaenda* are characterized by a regular, sympodial-dichasial branching of their ultimate elements (Puff et al., 1993). Indumentum is approximately as dense as the young twigs and relatively constant within a species. In Philippine *Mussaenda*, the inflorescence axes may vary from being densely covered with trichomes to sparsely so (*M. liedeae* Alejandro and *M. viridiflora* Alejandro), or are almost glabrous (*M. grandibracteata*, *M. philippica* var. *philippica*, *M. pinatubensis*, and *M. scandens*). Small bracts are generally present on the inflorescence axes and flower pedicels. Bracts are opposite in arrangement, with linear or lanceolate to ovate shapes and acuminate or gradually pointed tips, and are normally caducous. In Philippine *Mussaenda*, bracts are usually entire, or trilobed with the lateral lobes always shorter. There are some reported 3- to 5-lobed bracts in African *Mussaenda* (e.g., *M. erythrophylla*). Jayaweera (1963) considered the bracts insignificant for differentiation among the Asian *Mussaenda* species. However, the Philippine species vary in the degree of indumentum and bract size and this may be useful for recognizing some Philippine species. The abaxial bract surface is usually glabrous or sparsely to densely covered with trichomes, or with a tuft of trichomes at the base (*M. multibracteata*), or with a few scattered trichomes only at the base (*M. nervosa*). One species, *M. grandibracteata*, can be recognized by its large bracts (7–13 × 2.5–5 mm).

FLOWERS

The flowers of *Mussaenda* are actinomorphic and usually 5-merous, although 6-merous flowers rarely occur (*M. benguetensis* and *M. palawanensis*). Among Philippine *Mussaenda*, only *M. benguetensis* and *M. viridiflora* emit a sweet scent similar to that of *Gardenia* J. Ellis. Bridson and Verdcourt (1988) recorded some sweet-scented species in African *Mussaenda* (e.g., *M. arcuata* Poir. and *M. microdonta*) and Malagasy *Bremeria* (e.g., *B. erectiloba* (Wernham) Razafim. & Alejandro).

CALYX

The calyx tubes are typically cup-shaped to shortly tubular. Both *Mussaenda grandibracteata* and *M. scandens* have extremely short calyx tubes (1.5–2.5 mm) comparable to those of some African *Mussaenda* species (e.g., *M. tenuiflora* Benth., *M. isertiana* DC., and *M. debeauxii* Wernham). Longer calyx tubes reaching to 8 mm or more are present in *M. multibracteata* and some African *Mussaenda* (e.g., *M. elegans*). The shape and size of calyx lobes vary and are taxonomically valuable for species identification in *Mussaenda*. In the Philippine species, calyx lobes are usually linear-lanceolate to subulate, or foliaceous (*M. multibracteata*), or greatly reduced to teethlike structures 1 mm long (*M. philippica* var. *philippica*), similar to those of some African (e.g., *M. polita* Hiern) and Asian species (e.g., *M. reinwardtiana* Miq.). The length of the calyx lobes in the Philippine *Mussaenda* may be categorized into: (a) 5 mm or less, (b) 6–10 mm, (c) 11–19 mm, and (d) 20 mm or more. Categories (a) and (b) are the most common, followed by (c) in six species (*M. acuminatissima*, *M. anisophylla*, *M. benguetensis*, *M. nervosa*, *M. palawanensis*, and *M. philippinensis*), and rarely (d) (*M. multibracteata*). In *M. benguetensis*, calyx lobes may be unequal, so that the same flower may have short and long lobes. Calyx lobes may also vary in the presence or absence of trichomes. Calyx lobes of Philippine *Mussaenda* are covered with trichomes on both sides, or only abaxially, or just along the middle part abaxially (*M. nervosa*). A rare condition of strongly reflexed calyx lobes was observed in *M. viridiflora*, quite comparable to the African *M. arcuata*.

CALYCOPHYLLS

What makes *Mussaenda* and other Mussaendeae (*Landiopsis*, *Pseudomussaenda*, and *Schizomussaen-*

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Short, straplike, verrucose trichomes in long-styled flower morphs. —G. *Mussaenda liedeae* Alejandro. Globular trichomes sparsely distributed in long-styled flower morphs. —H. *Mussaenda benguetensis* Elmer. Alternating short, straplike, and globular trichomes in long-styled flower morphs. A, taken from *Alejandro 108* (UBT); B, from *Pelzer 13555* (PNH); C, from the holotype of *M. liedeae*, *Alejandro 89* (UBT); D, from *Alejandro 30* (PNH); E, from *Alejandro 20* (UBT); F and G, from *Alejandro 108* (UBT); H, from the paratype of *M. liedeae*, *Alejandro 88* (L).

da) attractive is the presence of enlarged, showy calyx lobes that are here referred to as calycophylls (Delprete, 1996). Previous studies (e.g., Bremekamp, 1937; Jayaweera, 1964) have used the presence and/or absence of calycophylls as the basis to delimit *Mussaenda*. However, a recent molecular phylogenetic study showed that various African and Asian *Mussaenda* species both with and without calycophylls form a monophyletic group (Alejandro et al., 2005). All Philippine *Mussaenda* species possess the showy calycophylls, a good guide for locating them in the field at a distance. There are at least a few African *Mussaenda* species (e.g., *M. arcuata* and *M. elegans*), Asian *Mussaenda* (e.g., *M. uniflora*), and three Mussaendeae (*Bremeria*, *Heinsia*, and *Neomussaenda*) that do not bear calycophylls.

Calycophylls, composed of an expanded sepaloid blade and stalk, are occasionally produced by a certain terminal flower of a cyme and correspond generally to only one of the five calyx lobes of a single flower, except in *Mussaenda philippica* var. *aurorae*, in which all five calyx lobes develop into calycophylls. The shape of calycophylls is usually ovate to elliptic, or rarely orbicular (*M. liedeae*). The blades vary from 3–13 × 2–8.5 cm, usually with five longitudinal nerves, typically white or yellowish white (*M. grandifolia*, *M. milleri*, *M. pinatubensis*, and *M. scandens*). There are some reported African *Mussaenda* with vivid, striking colors like yellow-orange or carmine-red (*M. erythrophylla*).

COROLLA

Corolla tubes in *Mussaenda* are usually cylindrical or infundibular, slender or curved, and much longer than the lobes. A swollen part at the insertion of the anthers is typically observed in *Mussaenda* species with cylindrical tubes. Length and indumentum of corolla tubes are good characters to separate species in *Mussaenda*. In the Philippine species, corolla tubes vary in length from 1 to 4 cm. In most species they are 2–3 cm long or between 3 and 4 cm (e.g., *M. albiflora* Merr., *M. attenuifolia*, and *M. ustii*), and rarely less than 2 cm (*M. lanata*). Longer corolla tubes are rarely found in some African *Mussaenda* with 4 cm or more (e.g., *M. isertiana*) and Asian *Mussaenda* with 6 cm (e.g., *M. pluviatilis* S. Moore). In Mussaendeae, extremely large corolla tubes reaching 5–15 cm in length characterize *Bremeria*.

The outer part of the corolla tubes in *Mussaenda* is typically covered with trichomes that extend to the abaxial side of the corolla lobes, or with few scattered trichomes (e.g., *M. grandibracteata*); often the lower part of some species becomes nearly glabrous after anthesis, rarely completely glabrous (e.g., *M. corymbosa* Roxb. and *M. scratchleyi* Wernham). The inner lower half of the corolla below the stamens is glabrous in *Mussaenda*, whereas in other Mussaendeae the whole inner part of the corolla is covered with trichomes (e.g., *Bremeria*). In its upper portion, the corolla tube is usually covered with unicellular, yellow trichomes (Fig. 1C–H), rarely glabrous as in *M. grandifolia*. Variation of trichomes inside the corolla, which was not documented in Jayaweera's (1964) revision or by any other author, is an important character in recognizing some Philippine *Mussaenda*. Generally, heterostylous *Mussaenda* possess distinct disparate flat trichomes inside the corolla. In short-styled flower morphs, the trichomes are dense, long, not striate, ribbon-like (Fig. 1C, D) and extending to the base of anthers. In contrast, the trichomes of long-styled flower morphs are sparse, short, striate, ribbon-like (Fig. 1E), or straplike (Fig. 1F), and/or verrucose, globular (Fig. 1G), and extend to the short filaments. In *M. benguetensis*, the trichomes of long-styled flower morphs are mixed or alternating short-strapped and globular (Fig. 1H). A combination of globular and ribbon-like trichomes near the base of anthers is a trend especially found in Palawan *Mussaenda* (*M. setosa* Merr. and *M. liedeae*). The differentiation in type and density of trichomes between the two flower morphs is also observed in some African and Asian *Mussaenda* species. Robbrecht (1988) described a rare short longitudinal split in the base or middle of corolla tubes in some Rubiaceae genera including *Mussaenda*, reminiscent of *Stackhousia* Sm. (Celastraceae). However, this particular character was not observed in any Philippine *Mussaenda*.

The corolla lobes of Philippine *Mussaenda* are usually elliptic to ovate, rarely somewhat truncate (*M. lanata*), or linear-lanceolate (*M. albiflora*). Their sizes usually range from 1.2–10 × 1–6 mm, or rarely to 22 mm long (*M. albiflora*). The color is usually orange to yellow, or rarely white (*M. albiflora*), or a combination of yellow median ridges and white margins (*M. ustii*). A more spectacular coloration is present in African *Mussaenda* (e.g., *M. elegans*) that have pink to orange or bright red corolla lobes.

Bridson and Verdcourt (1988) distinguished *Pseudomussaenda* from *Mussaenda* by having apical filiform appendages at the tip of each corolla lobe. However, Puff et al. (1993) correctly argued that these appendages also occur within *Mussaenda*, where half of the Philippine species bear them. Therefore, the presence or absence of such appendages is not reliable for generic delimitation in Mussaendeae.

Jayaweera (1964) used the occurrence of trichomes surrounding the corolla opening to delimit Asian *Mussaenda*. He emphasized that such trichomes are absent in the Philippine taxa but present in the species of India and Sri Lanka. Based on our recent collections, some Philippine *Mussaenda* are observed with trichomes in the corolla opening (e.g., *M. benguetensis*, *M. magallanensis* Elmer, and *M. ustii*).

AESTIVATION

There are two main types of corolla aestivation in the Mussaendeae, imbricate and valvate (see Robbrecht, 1988: fig 29). Imbricate aestivation is found in both *Heinsia* and *Landiopsis*. Valvate aestivation occurs in three variations: induplicate-valvate (*Neomussaenda*, *Pseudomussaenda*, and *Schizomussaenda*), reduplicate-valvate (*Mussaenda*), and a combination of induplicate- and reduplicate-valvate (*Bremeria*). The last two valvate aestivation types are reliable characters to delimit both *Mussaenda* and *Bremeria* (Alejandro et al., 2005).

ANDROECIUM

The stamens of Mussaendeae are separate, of equal sizes, and inserted around the middle of the corolla tube. In *Mussaenda*, the stamens of short-styled flower morphs are typically inserted above the middle of the corolla, rarely at the middle (e.g., *M. isertiana*). In contrast, the stamens of long-styled flower morphs are located at the middle, and rarely below the middle of the corolla (e.g., *M. setosa* and *M. afzelioides* Wernham).

The anthers of Philippine *Mussaenda* are usually linear, dorsibasifixed, dehiscing along longitudinal slits, and typically bilobed at the base. The short-styled flower morphs usually have longer anthers than the long-styled flower morphs. Generally, the filaments of anthers are short, filiform, usually adhering to the corolla tubes almost along their entire length, and glabrous except for a few trichomes found in *M. benguetensis*.

GYNOECIUM

The cylindrical-turbinate ovary of *Mussaenda* is usually bicarpellate, or rarely 3- or 4-locular (e.g., *M. nannanii* Wernham). All Philippine species are bicarpellate; the locules are pluriovulate and separated by a septum. Puff et al. (1993: figs. 3–8) demonstrated the anatomical details of the ovary and fruits among African *Mussaenda*, *Pseudomussaenda*, and *Schizomussaenda*. Similar features of the ovary and fruits were observed in Philippine *Mussaenda*. The placenta is peltate, inserted to most of the length of the septum, and T-shaped in cross-section with the ends of the cross-bar incurved. The ovules are numerous and embedded in a soft pulp.

The styles of *Mussaenda* are usually slender and glabrous. In the Mussaendeae, only *Bremeria* is characterized by pubescent styles as one of its synapomorphies. The length of styles in the Philippine *Mussaenda* ranges from 1 to 8 mm in short-styled flowers and from 10 to 25 mm in long-styled flower morphs, except for long-styled flowers in *M. lanata*, which are 5–7 mm. A well-developed, fleshy, annular, glabrous disk that is persistent in the fruit surrounds the base of the style. The stigma of *Mussaenda* is elongated and bilobed, and ranges from 1 to 4 mm in short-styled and from 3 to 12 mm in long-styled flower morphs. The short stigmatic lobes are usually spreading, while the longer lobes are recurving. The two stigmatic arms are semi-exserted in a few Philippine species of long-styled flower morphs (e.g., *M. magallanensis*, *M. ustii*, and *M. liedeae*).

FRUITS

Previous studies used fruit types (berry vs. capsular) as one of the main bases for delimiting *Mussaenda*. Segregates *Pseudomussaenda* and *Schizomussaenda* are characterized by dehiscent, capsular fruits, whereas *Mussaenda* has indehiscent, berry-like fruits. In other Mussaendeae, the fruits of *Landiopsis* are dehiscent capsules; those of both *Heinsia* and *Bremeria* are fleshy and indehiscent; and only *Neomussaenda* is distinguished by its drupaceous fruits.

The fruits of *Mussaenda* are pedicellate, generally warty, ellipsoid to obovoid, or rarely globose, green when young, and brown to blackish at maturity, as far as observed. *Mussaenda* fruits rarely exceed 2 cm in length. The average size in the Philippines ranges from 1–2 × 0.6–1.4 cm. Vertical ridges are usually absent, rarely prominent (e.g., *M. acuminatissima* and *M. albiflora*). Conspicuous annular disks typically crown the fruits, and persistent calyces were observed in five Philippine species (*M. acuminatissima*, *M. anisophylla*, *M. multibracteata*, *M. philippinensis*, and *M. vidalii*). In some species, the calyx lobes may reach a length of 1 cm and then often get damaged in the fruit stage. The exocarp is usually covered with trichomes, rarely glabrous (e.g., *M. nervosa* and *M. scandens*). The mesocarp ranges from 0.3 to 1.2 mm in thickness.

SEEDS AND EXOTESTA

The seeds of *Mussaenda* are usually small, numerous, more or less angular to rounded, laterally

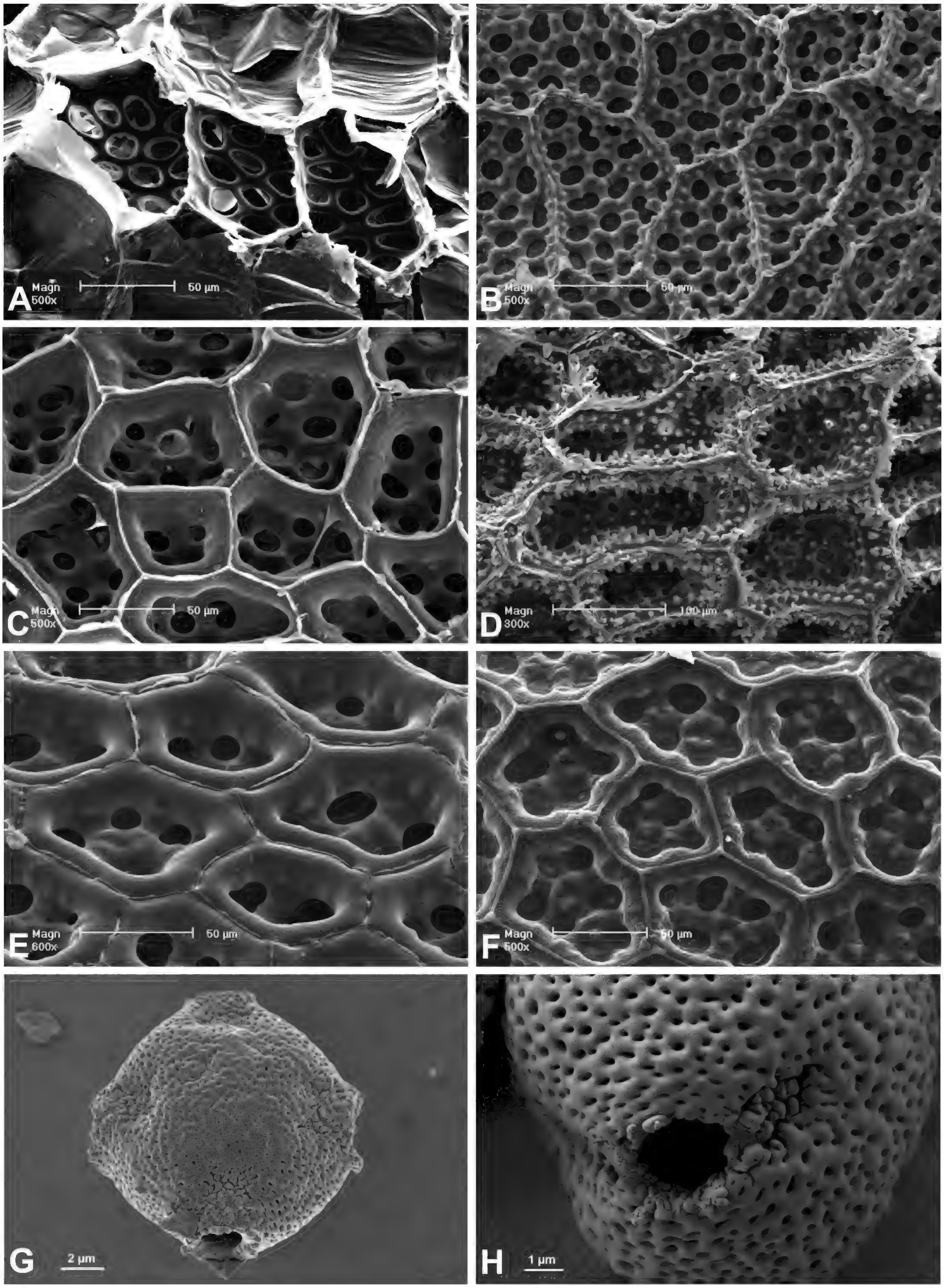

Figure 2. A–F. Seed exotesta cells of Mussaendeae, the outer tangential walls removed in B–F, but retained in A. —A. *Mussaenda debeauxii* Wernham from Africa. —B. *Pseudomussaenda flava* Verdc. from Africa. —C. *Bremeria pervillei* (Wernham) Razafim. & Alejandro from Madagascar. —D. *Heinsia crinita* (Afzel.) G. Taylor from South Africa. —E. *Mussaenda acuminatissima* Merr. —F. *Mussaenda magallanensis* Elmer. G, H. Pollen of *M. anisophylla* S. Vidal. —G. Four-colporate pollen. —H. Foveolate tectum. A, taken from *Schoenmaker 388* (WAG); B, from *Friis et al. 8030* (BR); C, from *Humbert 18745* (P); D, from *Sonké 308* (BR); E, taken from the lectotype of *M. acuminatissima*, *Ramos Bureau of Sci. no. 33133* (NY); F, from *Alejandro 3* (UBT); G and H, from *Alejandro 65* (*Univ. Santo Tomas Hb.*).

flattened, and brown to black. The size of seeds is less than 1 mm in all Philippine species, although seeds of some African *Mussaenda* can exceed 1 mm (e.g., *M. arcuata*). Variation in size and shape of seeds often occurs in a single fruit. The seed coat is exotestal, a typical character in Rubiaceae.

In the Mussaendeae, the exotesta cells are polygonal in surface view (described as reticulations by Jayaweera, 1963, 1964). The outer tangential walls of exotesta are thin and more or less smooth (Fig. 2A), while the radial walls are considerably thickened (Fig. 2A–F). Prominent large pits are present on the inner tangential walls (Fig. 2A–F) except for *Schizomussaenda* with small pits (Puff et al., 1993: fig. 11). In Philippine *Mussaenda*, these perforations vary in number from two to 10; only few reach more than 10 (e.g., *M. chlorantha* and *M. nervosa*). There are African *Mussaenda* characterized by up to 14 perforations (e.g., *M. debeauxii*: Fig. 2A), or up to 20 (e.g., *M. soyauxii* Büttner). *Pseudomussaenda* has even 20 or more perforations (*P. flava* Verdc.: fig. 2B). Seed perforations of both *Bremeria pervillei* (Wernham) Razafim. & Alejandro (Fig. 2C) and *Heinsia crinita* (Afzel.) G. Taylor (Fig. 2D) are within the range of *Mussaenda*. The number of perforations sometimes varies, even in the inner tangential walls of a seed.

Seed ornamentation may be present or absent in Mussaendeae. Tubercular thickenings along the radial and inner tangential walls can be numerous, well-protruding (*Heinsia crinita*: Fig. 2D), or fewer and less conspicuous (*Pseudomussaenda flava*: Fig. 2B), or slightly prominent (e.g., *Mussaenda acuminatissima*: Fig. 2E; *M. magallanensis*: Fig. 2F; and *M. ustii*), or absent (e.g., *M. debeauxii*: Fig. 2A; and *M. tristigmatica* Cumm.).

POLLEN, HETEROSTYLY, AND DIOECY

Pollen studies are available for Mussaendeae, particularly African and Asian *Mussaenda* (Gideon, 1989; Puff et al., 1993; Andersson, 1996). In Philippine *Mussaenda*, pollen grains are usually tetracolporate (Fig. 2G), but occasionally tricolporate grains were observed (cf. Puff et al., 1993). The average diameter ranges from 10.8 μm in *M. liedeae* to 19.8 μm in *M. benguetensis* (Alejandro, pers. obs.). Pollen exine is typically foveolate (Fig. 2H), as previously described by Andersson (1996) for Afro-Asian *Mussaenda* and *Pseudomussaenda*.

It is worth noting that long-styled morphs of the flower typically lack (fertile) pollen and that all pollen measurements were taken from short-styled flower morphs. Jayaweera (1964) previously observed that the long-styled flower morphs do not shed or form pollen, but he failed to mention the dioecism of the genus. All populations of the Philippine *Mussaenda* comprise two style-length morphs. The short-styled flower morphs represent the staminate condition in which the gynoecium ceases to grow and remains sterile, while the long-styled flower morphs are pistillate and have sterile anthers. This condition was earlier observed in *M. pubescens* W. T. Aiton and termed as cryptic dioecy (Li et al., 2010).

CHROMOSOMES

Chromosome numbers of over 30 taxa of African and Asian *Mussaenda* have been counted, and invariably $x = 11$ has been the basic chromosome number (Priyadarshan & Ramachandran, 1984; Kiehn, 1986, 1995, 1996; Philip & Mathew, 1988; Puangsomlee & Puff, 2001). These studies unanimously report that *Mussaenda* species are diploid, and polyploidy seems to be relatively insignificant. Chromosome counts from Philippine plant material are available for *M. philippica* s. str. and *M. philippica* var. *aurorae*, and the three cultivars Doña Aurora, Doña Luz, and Sirikit. These all possess $2n = 22$ (Priyadarshan & Ramachandran, 1984; Philip & Mathew, 1988). We also investigated root tips of *M. philippica* var. *philippica* (*Alejandro 10164*) propagated at the University of Bayreuth following Tjio and Levan (1950) and Snow (1963). We counted $2n = 22$ chromosomes from somatic metaphases. The chromosomes are fairly uniform in size, measuring about 1.15 μm in length. The basic chromosome number of $x = 11$ is the most widespread in flowering plants, also consistent in Ixoroideae (De Block, 1998) and several woody tribes of Rubiaceae such as the Gardenieae, Psychotrieae p.p., Anthospermeae, and Pavetteae (Philip & Mathew, 1988; Robbrecht, 1988; Corrêa et al., 2010).

POLLINATION AND DISPERSAL

The conspicuous, brightly colored calycophylls contrast with the large, dark green leaves of *Mussaenda* plants, or surrounding vegetation, and serve as a visual signal for attraction of flower visitors and pollinators. Borges et al. (2003) demonstrated that the white calycophylls of *M. frondosa* L. absorb ultraviolet light, whereas reflectance for longer wave lengths is much higher than that of the leaves. Predominantly, butterfly pollinators are attracted. For *M. pubescens* in Hong Kong, Corlett (2001) observed butterfly species of *Papilio* L. and *Graphium* Scopoli (Papilionidae) as frequent visitors and apparent pollinators of the flowers. The high reflectance of the calycophylls possibly also causes an effective attraction of nocturnal lepidopteran pollinators such as the

Sphingidae (*Cephonodes hylas* L., species of *Macroglossum* Scopoli), as has been demonstrated by Naiki and Kato (1999) for *M. parviflora* Miq. Removal of calycophylls in *M. frondosa* significantly decreases pollinator attraction (cf. Borges et al., 2003), while nectar-robbing bees continue to find the flowers. For the Philippine *Mussaenda*, any pollination data are still missing. Birds have been observed in the field to eat the ripe fruits of *Mussaenda* (Alejandro, pers. obs.) and may be important disseminators of the seeds.

HABITAT AND DISTRIBUTION

Mussaenda thrive in diverse climatic and environmental conditions and in a wide range of soil types. Recent collections in the Philippines were made between 0 and 3000 m, and from habitats ranging from coastal scrubs and thickets, disturbed roadsides, ravines, along river and stream banks, secondary and primary forests, savanna forests, and lowland or montane forests. *Mussaenda* species occasionally grow in ultramafic soils; they seem to prefer more well-drained, clayey, loamy, or sandy, humid soils. Few species prefer the canopy of the thick forest, but the majority flourish in the semi-shade or open forest, displaying their attractive calycophylls and sometimes extending their branches over the neighboring shrubs. The wild Mussaendas are similar to the propagated varieties, requiring full sunlight for healthier and more colorful blooms. *Mussaenda* grown under semi-shade or filtered light are lanky with fewer and less colorful calycophylls (Rosario, 1998). Several African and Asian species (e.g., *M. erythrophylla*, *M. parvifolia* Valeton, and *M. philippica* var. *philippica*) are grown as ornamentals both in and outside their natural distribution ranges and may be found in the Philippines.

Mussaenda is widely distributed throughout tropical Africa eastward to eastern and southeastern Asia, to southernmost Japan, and southward to New Guinea and Australia. In the Philippines, most *Mussaenda* species occur in Luzon (extending to the Batanes Islands), followed by the endemic species from Mindanao (*M. attenuifolia*, *M. nervosa*, *M. scandens*, and *M. vidalii*), Palawan (*M. grandifolia*, *M. liedeae*, *M. palawanensis*, and *M. setosa*), and the Visayas (*M. albiflora*, *M. ustii*, and *M. viridiflora*). *Mussaenda philippica* var. *philippica* is the only taxon distributed almost throughout the Philippines, extending eastward to the Caroline group and southward to the Solomon and Fiji Islands.

ECONOMIC USES

Aside from its ornamental purposes, indigenous use of *Mussaenda* is not common in the Philippines based on personal interview, literature, and herbarium label information. Only a few *Mussaenda* species are used medicinally such as *M. anisophylla* (asthma), *M. vidalii* (antiseptic or ophthalmic drops), *M. philippica* var. *philippica* (stomach and headache, snake bites, dysentery, minor chest pains, jaundice, and emollient) (Guerrero, 1921). Salvoza (1948) included *M. philippica* var. *philippica* in the list of Philippine trees and shrubs yielding crude drugs. Some Philippine *Mussaenda* have various local uses such as for fuel, handicrafts, small furniture, and even for agricultural rituals (Alejandro, pers. obs.).

TAXONOMIC TREATMENT OF PHILIPPINE *MUSSAENDA*

Mussaenda Burm. ex L., Sp. Pl. 1: 177. 1753. TYPE: *Mussaenda frondosa* L.

Asemanthia (Stapf) Ridl., Bull. Misc. Inform. Kew 1939(10): 599. 1940. TYPE: *Asemanthia coccinea* (Stapf) Ridl. [≡ *Mussaenda coccinea* Stapf, nom. illeg.]

Spallanzania DC., Prodr. [A. P. de Candolle] 4: 406. 1830 [late Sep. 1830]. TYPE: *Spallanzania corymbosa* DC.

Trees or shrubs, rarely scandent or suffrutices, to 8 m tall; young twigs somewhat flattened to terete, green to grayish green, or brown, glabrous or variously indumented, the trichomes cylindrical, white, or brown to reddish brown color; older branches (sub)terete, lenticellate, bark easily peeled, reddish to grayish brown, or brown, glabrous or with few scattered trichomes. Leaves opposite and decussate, sometimes anisophyllous, variously indumented, rarely glabrous; leaf blades ovate or elliptic, rarely obovate to orbicular, (sub)coriaceous to membranous; margins entire, rarely slightly sinuate, glabrous or ciliate, apex acute or acuminate to subcaudate, rarely conduplicate, base cuneate or attenuate to obtuse, secondary veins brochidodromous, in 5 to 15 (to 18) pairs, usually prominulous, rarely sunken above; petioles to 8 cm, rarely subsessile; stipules interpetiolar, usually triangular, or ovate, sometimes basally fused forming a ring around the node, persistent or deciduous, apices bifid 1/8 to 3/4 of their length, the lobes erect and rarely spreading away from each other, abaxially with indument, adaxially with indument all over or only at the base and/or apex, colleters few or numerous, in continuous rows and/or in groups of 2 at the stipule base. Inflorescences terminal, rarely becoming pseudoaxillary, cymose corymbs, ultimate elements regular, sympodial-dichasial branching, spreading or congested, glabrous or variously hairy; bracteate, bracts linear or lanceolate to ovate, entire or trilobed with the lateral lobes always shorter, adaxially variously indumented, abaxially glabrous to pubescent all over or rarely with tuft of trichomes only at the base. Flowers heterostylous and/or dioecious, 5-merous, or rarely aberrantly 6-merous, congested (calycophyllous pseudanthia), odorless, rarely sweet-scented, shortly pedicellate; pedicels to 7 mm, pubescent, rarely glabrous; calyx tubes cup-shaped to shortly tubular, or extremely reduced, usually indumented, rarely glabrous; calyx lobes extremely short or long, linear to lanceolate or ovate, rarely foliaceous, rarely strongly recurved, abaxially with trichomes, adaxially glabrous or with trichomes, occasionally with a single calycophyll, rarely with 5 calycophylls; colleters usually in sinuses between calyx lobes, rarely in a row at the base; calycophylls restricted to the terminal flowers of inflorescence, elliptic to ovate, or orbicular, 5(to 7)-nerved, white, or cream to yellowish white, glabrous or pubescent along the nerves of both sides, calycophyll margins glabrous or ciliate, apex apiculate or acute to acuminate or subcaudate, base cuneate to attenuate or obtuse, calycophyll stalks 1–3.5 cm long, usually pubescent; corolla salverform to narrowly funnelform, variously indumented, corolla tube cylindrical or infundibular, sometimes curving, usually forming a distinctly swollen part around anthers when cylindrical, yellowish green/white or greenish white/yellow to white, with or without trichome tuft surrounding the opening, typically with unicellular trichomes inside; short-styled flower morphs with dense long, flat, unstriated, ribbon-like trichomes extending to the base of anthers from the top of corolla; long-styled flower morphs with sparse short, flat, striated, ribbon-like or straplike, and/or rarely with verrucose, globular trichomes extending to the short filaments from the top of corolla; lobes valvate-reduplicate, elliptic to ovate, rarely linear to lanceolate, or somewhat truncate to orbicular, median ridge distinct, corresponding to the infolded part of the lobe before anthesis, orange to yellow, rarely white, abaxially pubescent, adaxially papillate; apex with or without filiform appendages, rarely recurved; stamens 5, included, glabrous, usually inserted in distal quarter, or immediately below the opening in short-styled flowers, around the middle in long-styled flower morphs, filaments short, fused for most of their length with the corolla tube; anthers linear, dorsibasifixed, bilobed at the base, dehiscing by longitudinal slits, the apex acute or obtuse; pollen colporate, 10.35–19.80 μm diam., exine foveolate, apertures 4, rarely 3; ovary cylindric to turbinate, bilocular; annular disk conspicuous, glabrous in both short- and long-styled flower morphs; style cylindrical, glabrous; stigma lobes 2, smooth or papillose, included or semi-exserted, usually recurved in long-styled flower morphs; carpellary placenta peltate, T-shaped with the ends incurved in cross-section; ovules numerous, embedded in fleshy placentas. Fruits fleshy, berry-like, ellipsoid to obovoid or globose, warts usually present, vertical ridges rarely prominent, brownish black when ripe, calyces deciduous or persistent, glabrous or pubescent; exocarp thin; mesocarp well-developed; seeds ± angular, less than 1 mm; exotesta cells polygonal, outer tangential walls thin and ± smooth, radial tangential walls thickened, inner tangential walls porous, tuberculate thickenings rarely prominent. Chromosome number: $2n = 22$ (Priyadarshan & Ramachandran, 1984; Kiehn, 1986, 1995, 1996; Philip & Mathew, 1988; Puangsomlee & Puff, 2001).

Key to the Philippine Species of *Mussaenda*

1a. Stipules distinctly diverging, broadly oblong to broadly ovate; corolla tube with mixed or alternating globular and straplike trichomes inside long-styled flower morph .... 5. *M. benguetensis* Elmer
1b. Stipules at the most slightly diverging, triangular to ovate; corolla tube with either globular, or strap- or ribbon-like trichomes inside long-styled flower morph.
  2a. Leaf blades with distinctly sunken midrib and veins adaxially; calyx lobes with trichomes only along the median portion externally .... 15. *M. nervosa* Elmer
  2b. Leaf blades with prominulous midrib and veins adaxially; calyx lobes with trichomes all over surface externally .... 3.
    3a. Calyx tube 6–8 mm long; calyx lobes foliaceous, 20–27 × 6–7 mm .... 14. *M. multibracteata* Merr.
    3b. Calyx tube 1.5–6 mm long; calyx lobes not foliaceous, less than 20 × 3 mm .... 4.
      4a. Young twigs and inflorescences glabrous or puberulous.
        5a. Stipules bifurcate for 1/8 of their length; bracts numerous, 2.5–5 mm wide .... 7. *M. grandibracteata* Alejandro
        5b. Stipules bifurcate for 1/4 to 3/4 of their length; bracts few, 0.8–1.7 mm wide .... 6.
          6a. Leaf apices strongly conduplicate; calyx tube 1.8–2.5 mm long; corolla without filiform apical appendages .... 20. *M. scandens* Elmer
          6b. Leaf apices not conduplicate; calyx tube 3–7 mm long; corolla with filiform apical appendages .... 7.
            7a. Calyx lobes 7–8 × 0.8–1 mm; calycophylls yellowish white .... 19. *M. pinatubensis* Elmer
            7b. Calyx lobes 1.5–3.5(–7) × 1.5–2 mm; calycophylls white or cream .... 17. *M. philippica* A. Rich.

4b. Young twigs and inflorescences prominently indumented ..... 8.

8a. Corolla tube infundibular, bulging very weakly or slightly around anthers.

9a. Leaf blades ovate or obovate to orbicular, not elliptic; corolla tube 1.1–1.5 cm long ..... 9. *M. lanata* C. B. Rob.

9b. Leaf blades ovate or elliptic to obovate; corolla tube 2–4 cm long ..... 10.

10a. Young twigs and inflorescences densely velvety; corolla tube glabrous internally in long-styled flower morph ..... 8. *M. grandifolia* Elmer

10b. Young twigs and inflorescences hirsute or pilose; corolla tube always with trichomes internally in long-styled flower morph ..... 11.

11a. Calyx lobes linear to narrowly lanceolate; fruit calyces persistent ..... 12.

12a. Stipules with sparse indument only at adaxial base; fruits sparsely warty, with prominent vertical ridges ..... 1. *M. acuminatissima* Merr.

12b. Stipules with sparse indument evenly distributed on adaxial side; fruits smooth, without vertical ridges ..... 18. *M. philippinensis* Merr.

11b. Calyx lobes lanceolate or subulate to ovate; fruit calyces deciduous or subpersistent ..... 13.

13a. Corolla lobes 5–10 × 3–3.5 mm, with filiform apical appendages ..... 16. *M. palawanensis* Merr.

13b. Corolla lobes 4–5 × 4–6 mm, without filiform apical appendages ..... 14.

14a. Trees, with pilose indumentum; stipules adaxially densely pilose; fruits obovoid, 1–1.4 cm long ..... 6. *M. chlorantha* Merr.

14b. Erect or scandent shrubs, with hirsute indumentum; stipules adaxially sparsely hirsute only at the apex and base; fruits ellipsoid, 1.5–2.2 cm long ..... 23. *M. vidalii* Elmer

8b. Corolla tubes cylindrical, bulging distinctly around anthers ..... 15.

15a. Corolla lobes purely white or the bases and median ridges green-tinged ..... 16.

16a. Leaf blades densely hirsute abaxially; flowers odorless; calyx lobes not recurved, 6–8 mm long; corolla lobes linear-lanceolate, usually 9–12 mm long, sometimes to 22 mm ..... 2. *M. albiflora* Merr.

16b. Leaf blades sparsely pubescent abaxially; flowers sweet-scented; calyx lobes strongly recurved, 3–4 mm long; corolla lobes ovate, 8–10 mm long ..... 24. *M. viridiflora* Alejandro

15b. Corolla lobes orange to yellow with white margins ..... 17.

17a. Inflorescences with numerous bracts ..... 18.

18a. Stipules adaxially densely indumented throughout; corolla densely hirsute in bud stage; corolla lobes 5–6 mm long, orange to yellow ..... 3. *M. anisophylla* S. Vidal

18b. Stipules adaxially sparsely indumented only at base; corolla pilose in bud stage; corolla lobes 7–13 mm long, yellow with white margins ..... 22. *M. ustii* Alejandro

17b. Inflorescences with few bracts ..... 19.

19a. Stipules with adaxial indument only at base; calyx lobes with trichomes only abaxially; corolla tube with short, globular trichomes inside long-styled flower morphs ..... 20.

20a. Leaf blades setose abaxially; calyx tubes 3–3.5 mm long; calyx lobes 4–6 mm long; corolla buds densely hirsute ..... 21. *M. setosa* Merr.

20b. Leaf blades sparsely hirsute abaxially; calyx tubes 5–6 mm long; calyx lobes 2–4 mm long; corolla buds densely pubescent ..... 10. *M. liedeae* Alejandro

19b. Stipules with adaxial indument all over surface; calyx lobes with trichomes on both surfaces; corolla tube with short, flat, straplike trichomes inside long-styled flower morphs ..... 21.

21a. Young twigs and inflorescences densely pubescent; leaf bases attenuate ..... 4. *M. attenuifolia* Elmer

21b. Young twigs and inflorescences mainly hirsute; leaf bases cuneate or obtuse ..... 22.

22a. Young twigs and inflorescences with reddish brown trichomes; calycophylls yellowish white, with base attenuate ..... 13. *M. milleri* Elmer ex Alejandro

22b. Young twigs and inflorescences with white to gray or brown trichomes; calycophylls white, with base cuneate.

23a. Leaf margins glabrous; flower pedicels 0.5–1.5 mm long; calyx lobes 3.2–14 × 1.2–4 mm ..... 11. *M. macrophylla* Wall.

23b. Leaf margins ciliate; flower pedicels 2–2.5 mm long; calyx lobes 4–5 × 0.5–1 mm ..... 12. *M. magallanensis* Elmer

1. **Mussaenda acuminatissima** Merr., Philipp. J. Sci. 17(Pt. C): 436–437. 1920. TYPE: Philippines. Ilocos Norte: Luzon, Mt. Nagapatan, 18°16′N, 120°37′E, 8 Aug. 1918, *Bureau of Science 33133* [*M.*] *Ramos* (lectotype, designated by Jayaweera [1964: 105], NY [barcode] 00132303!). Figure 3.

Shrubs 3–3.5 m tall; young twigs green, hirsute, the trichomes more than 12-celled, brown; older branches lenticellate, reddish brown, glabrous. Leaf blades ovate or elliptic, 9–16 × 4.5–8.5 cm, membranaceous to (sub)coriaceous, sparsely pubescent on both sides, especially on the midrib and veins underneath, margins ciliate, apex acuminate to subcaudate, flat, base long attenuate; secondary veins in 10 to 12 pairs, prominulous above; petioles 1.3–2.5 cm, densely pubescent; stipules triangular, 7–15 × 2–3 mm at the base, deciduous, abaxially with dense indument, adaxially with sparse indument only at the base of stipule, bifid for 1/4 to ± half of length, the lobes not diverging; colleters numerous, in groups of 2 at stipule base. Inflorescences terminal, sometimes axillary from terminal leaf pairs, congested, densely hirsute; bracts few, linear to narrowly lanceolate, entire or bilobed, 5–9 × 1–2.5 mm, sparsely pubescent underneath, glabrous or sparsely pubescent above; flower pedicels 2–2.5 mm, densely strigose. Flowers odorless, with only long-styled flower morphs seen; calyx tubes cup-shaped to shortly tubular, 3.5–4 mm, densely hirsute; calyx lobes linear to narrowly lanceolate, erect, 8–15 × 1–1.4 mm, hirsute on both sides, occasionally with a single calycophyll; colleters as 1 pair per lobe, in sinuses between calyx lobes; calycophylls with blades elliptic or elliptic to ovate, 5-veined, 4–11.2 × 5.5–6 cm, white or cream, sparsely pubescent especially along nerves on both surfaces, margins ciliate, apex acuminate, base cuneate, calycophyll stalks 1.5–2.2 cm, densely pubescent; corolla in buds densely hirsute, becoming hirsute only in upper half and with few scattered trichomes below in open flowers; corolla tubes infundibular, swollen portion around anthers indistinct, 2.3–2.5 cm long, cream, with tuft of trichomes surrounding the opening internally; in long-styled flower morphs with sparse short, striate, ribbon-like trichomes internally to the short filaments from the top; corolla lobes ovate, 3.5–4.5 × 3.5–4 mm, yellow or yellow-orange, abaxially hirsute, adaxially papillate, at apex spreading, without filiform apical appendages; stamens inserted around middle of the corolla tube in long-styled flower morphs, filaments glabrous, anthers linear, 4–4.5 mm in long-styled flower morphs, glabrous, apex acute; pollen diameter to 14.85 μm, apertures 4; ovary 3–3.5 × 2–2.5 mm, style 10–15 mm in long-styled flower morphs, stigma 5–7 mm, smooth, erect, included in long-styled flower morphs. Fruits ellipsoid to obovoid, 1–1.5 × 0.8–1 cm, with sparse warts, vertical ridges 8 to 10; calyces persistent, sparsely to densely hirsute; mesocarp 0.4–0.6 mm thick; fruiting pedicels 3–4 mm, densely hirsute; seeds 0.46–0.6 × 0.43–0.56 mm; exotesta cells with 3 to 5 pores on inner tangential walls, tuberculate thickenings absent.

Local names. Katuday-bantay (Ilk); Tinga-tinga (Tag), according to Alejandro (pers. obs.).

Phenology. *Mussaenda acuminatissima* has been observed to flower from August to October, and fruit in August, and November to December.

Distribution and habitat. *Mussaenda acuminatissima* appears to be locally rare and restricted to the provinces of Ilocos Norte and Batangas of Luzon. The species has been collected in primary and secondary forest edges, on ultramafic soils, from sites at elevations from 250 to 700 m.s.m.

Discussion. Merrill (1920: 437) mentioned only the one collection, "*Bur. Sci. 33133 Ramos*," in the protologue for *Mussaenda acuminatissima*. This was later considered as "type" and specified to the herbarium of deposit as "NY–lectotype" by Jayaweera (1964: 104 and 105, respectively). As a Bureau of Science collection for the Flora of the Philippines, Merrill's principal duplicate would have been deposited at PNH and was destroyed during World War II. The surviving duplicate at NY cited by Jayaweera as type was required after 1958 (Art. 40.1, McNeill et al., 2012) and specified the herbarium of deposit, sensu Articles 9.11 and 9.12.

This species is distinct from other hirsute Philippine *Mussaenda* with its short petioles only to 2.5 cm, narrow stipules with trichomes only at the base adaxially, few colleters on the calyx lobes, and warty fruits with prominent vertical ridges. So far the only recorded *Mussaenda* species in Ilocos Norte is *M. philippica* var. *philippica* and in Batangas, *M. anisophylla*. *Mussaenda acuminatissima* closely resembles *M. philippinensis* in the shape and size of the linear to narrowly lanceolate calyx lobes to 15 mm, which are persistent on the fruits, but the two species differ in the density of trichomes and in the shape of the leaves. In *M. acuminatissima*, the calyx lobes are hirsute but less pubescent to internally glabrate in *M. philippinensis*. Leaf blades are ovate to elliptic in *M. acuminatissima*, to 16 cm long, but are only elliptic in *M. philippinensis* but to 25-cm lengths.

Additional specimen examined. PHILIPPINES. **Luzon:** Batangas, Lobo, Mt. Mabilog, 13°38′N, 121°13′E, *Alejandro 60* (L, PNH, UBT, *University of Santo Tomas Herbarium* [*Univ. Santo Tomas Hb*], US).

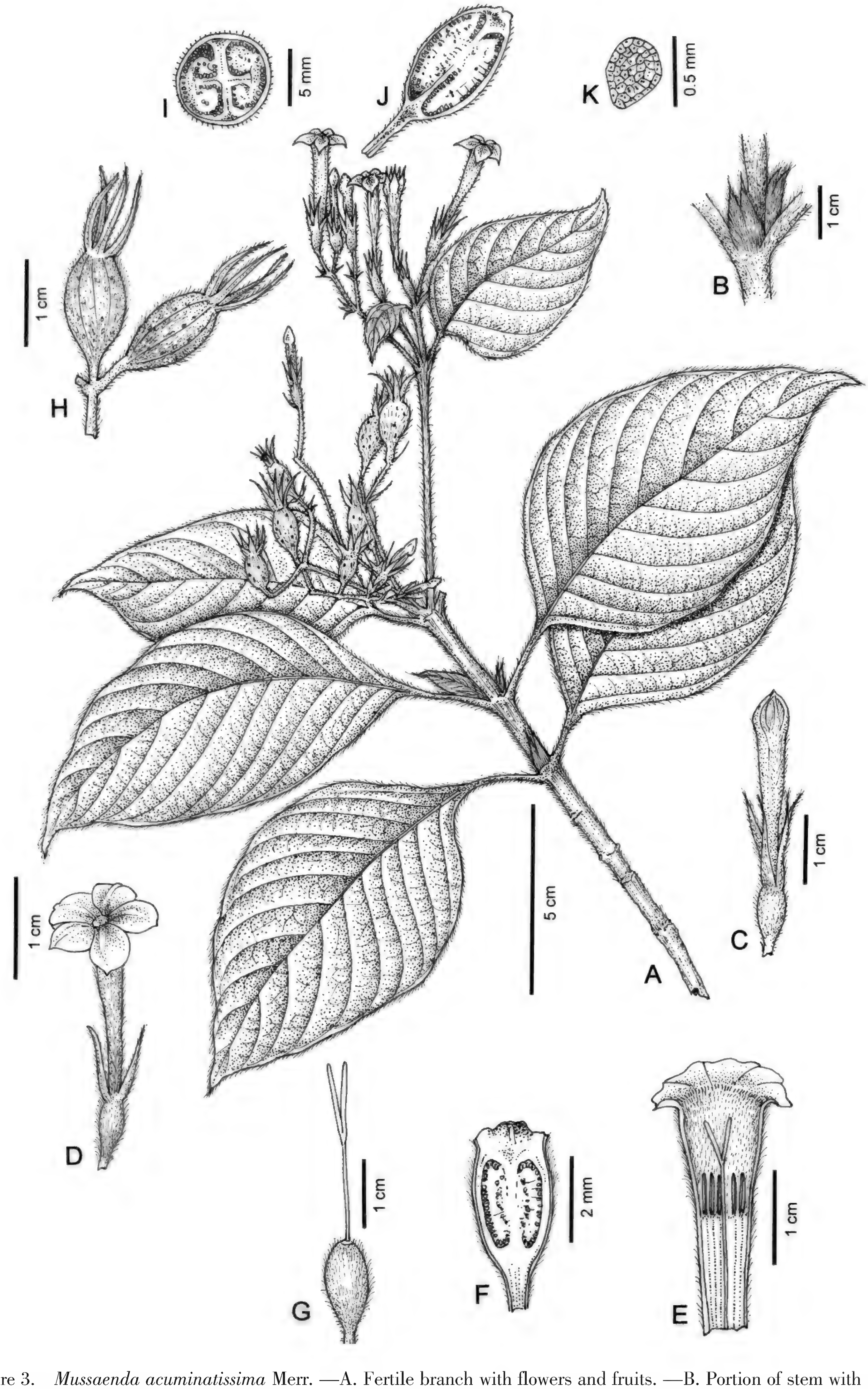

Figure 3. *Mussaenda acuminatissima* Merr. —A. Fertile branch with flowers and fruits. —B. Portion of stem with stipules. —C. Flower bud. —D. Open anthesal flower. —E. Long-styled flower morph, corolla tube dissected open in longitudinal section. —F. Longitudinal section through ovary. —G. Calyx, style, and stigma of long-styled flower morph, with the corolla and calyx lobes removed. —H. Fruits with vertical ridges and persistent calyces. —I, J. Fruit sections showing seed attachments to placentas, in cross and longitudinal sections, respectively. —K. Seed. A–D, H–K are taken from the lectotype *Ramos Bureau of Sci. no. 33133* (NY); E–G, from *Alejandro 60* (*Univ. Santo Tomas Hb.*).

2. **Mussaenda albiflora** Merr., Philipp. J. Sci. 5(Pt. C): 241–242. 1910. TYPE: Philippines. Negros Occidental, Sep. 1909, *Forest Bureau 17358* [*H. M. Curran*] (lectotype, designated by Jayaweera [1964: 107], NY [barcode] 00132304!; isolectotypes, K [bc] K000740920 digital image!, US [bc] 000137843 digital image!). Figure 4.

Shrubs 1.5–5 m tall; young twigs green, densely hirsute, the trichomes more than 12-celled, brown; older branches with few to many lenticels, reddish or grayish brown, glabrous or with few scattered trichomes. Leaf blades ovate to lanceolate or ovate to elliptic, 11–30 × 5.5–12.3 cm wide, membranaceous, hirsute above, densely hirsute, especially on midrib and veins abaxially, margins ciliate, apex contracted to acuminate or caudate, not conduplicate, base attenuate or rarely obtuse; secondary veins in 10 to 14 pairs, prominulous adaxially; petioles 1–3.5 cm, densely hirsute; stipules triangular or broadly ovate, 7–12 × 3.5–7.5 mm at the base, persistent or deciduous, abaxially with dense indument, adaxially with sparse to dense hirsute apex entire or bifid 1/8 or 1/4 of length, the lobes not diverging; colleters numerous, in groups of 2 at the base. Inflorescences spreading or congested, densely hirsute; bracts numerous, lanceolate, entire, or rarely bilobed, 7–10 × 1.5–3 mm, densely hirsute underneath, glabrous above; flower pedicels 2–3.5 mm, with sparsely appressed or ascending trichomes. Flowers odorless; calyx tubes cup-shaped to shortly tubular, 2.5–4 mm, hirsute; calyx lobes linear to narrowly lanceolate, not recurved, 6–8 × 1 mm, hirsute outside, glabrous inside, occasionally with a single calycophyll; colleters 1 pair per lobe, in sinuses between calyx lobes; calycophylls with blades ovate or elliptic to ovate, 5-nerved, 5–9.4 × 3–6 cm, white, sparsely pubescent along nerves on both surfaces, margins ciliate, apex acute or acuminate, base cuneate or obtuse; calycophyll stalks 1.5–3.3 cm, densely hirsute; corolla buds hirsute, becoming sparsely hirsute only on the upper half in open flowers; corolla tubes cylindrical, forming a distinctly swollen portion around anthers, 2.2–3.5 cm long, white or greenish white, without tuft of trichomes surrounding the opening; short-styled flower morphs with dense, long, unstriated, ribbon-like trichomes internally to the base of anthers from the top; long-styled flower morphs with sparse short, striate, ribbon-like trichomes internally to the short filaments from the top; corolla lobes linear to narrowly lanceolate, 9–12(–22) × 1–1.5(–4) mm, white, abaxially hirsute, adaxially papillate; apex recurved, without filiform apical appendages; stamens inserted in the distal 1/4 of corolla in short-styled flower morphs, inserted around middle of corolla in long-styled flower morphs, filaments glabrous, anthers linear, 3–4 mm in short-styled flower morphs, 3 mm in long-styled flower morphs, glabrous, apex obtuse; pollen diameters to 15.3 μm, apertures 4, rarely 3; ovary 3–3.5 × 1.5–2 mm, style 4–6 mm in short-styled flower morphs, 18–20(–23) mm in long-styled flower morphs, stigma 1.5–2 mm in short-styled flower morphs, 7 mm in long-styled flower morphs, smooth, recurved and included in long-styled flower morphs. Fruits ellipsoid or obovoid, 1–2 × 1–1.2 cm, with sparse to dense warts, vertical ridges slightly prominent, green, calyces deciduous or persistent, sparsely hirsute; mesocarp 0.5–0.7 mm thick; fruiting pedicels 5–8 mm, sparsely hirsute; seeds 0.67–0.83 × 0.43–0.53 mm; exotesta cells with 2 to 8 pores on inner tangential walls, tuberculate thickenings slightly prominent or inconspicuous.

Local names. Agboy (BisPn); Boyon (BisSL); Buyon (Bis), according to Alejandro (pers. obs.).

Phenology. *Mussaenda albiflora* has been collected in flower from April to November and in fruit from August to December.

Distribution and habitat. *Mussaenda albiflora* is known from Negros and Panay Islands. The species has been collected in low-altitude humid evergreen forests, on riverbanks, on roadsides, and on clay-loam soils. Its altitudinal distribution ranges from 50 to 400 m.s.m. This species is very abundant even on the roadsides of Aklan on Panay Island.

Discussion. Merrill (1910: 242) cited four collections in his protologue for *Mussaenda albiflora*, with the first two as "For. Bur. 17358 (type), 17539 Curran." Earlier 1906 Forest Bureau collections 5539 and 5218 credited Everett and Danao and Aspillera, respectively. Jayaweera later specified *Curran 17358* in his 1964 treatment of the genus "Type" and "NY–lectotype" on pages 105 and 107, respectively. As a Philippines Forest Bureau collection, one duplicate would have been deposited at PNH and destroyed during World War II. The surviving duplicate at NY is representative of the species and was selected as lectotype, sensu Articles 9.11 and 9.12 (McNeill et al., 2012). The qualification of type in Jayaweera's treatment of Philippine *Mussaenda* (1964: 105) was required after 1958 (cf. Arts. 40.1, 9.11, and 9.12, McNeill et al., 2012).

Mussaenda albiflora can be easily recognized by its long, linear to narrowly lanceolate corolla lobes that are pure white and the long and slender corolla tube to 3.5 cm; by the large, usually ovate to lanceolate leaves;

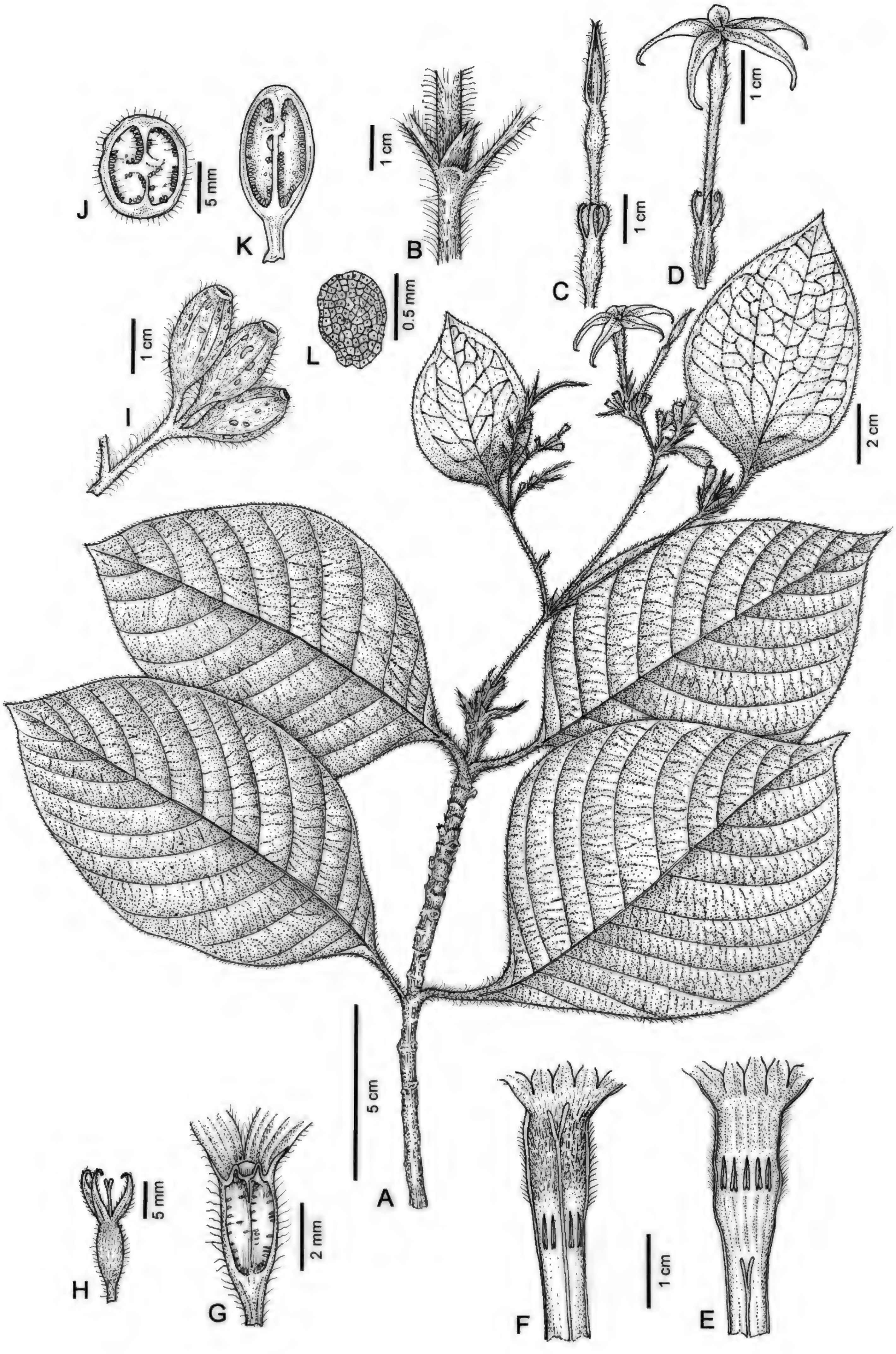

Figure 4. *Mussaenda albiflora* Merr. —A. Flowering branch. —B. Portion of stem with stipule. —C. Flower bud. —D. Open anthesal flower. —E. Short-styled flower morph, corolla tube dissected open in longitudinal section. —F. Long-styled flower morph, corolla tube dissected open in longitudinal section. —G. Longitudinal section through ovary. —H. Calyx, style, and stigma of short-styled flower morph. —I. Three fruits. —J, K. Fruit sections showing seed attachments on placentas, in cross and longitudinal sections, respectively. —L. Seed. A–E are taken from *Alejandro 30* (PNH); F–L, from *Alejandro 20* (UBT).

by the small anthers only to 4 mm in both short- and long-styled flower morphs; and by the long pedicels of the fruits, to 8 mm. It is one of the few species with long trichomes on both sides of the hirsute leaf blades, numerous bracts, recurved stigma in long-styled flower morphs, and slightly prominent vertical ridges on the fruits. *Mussaenda albiflora* resembles *M. ustii* and *M. anisophylla* in the morphology and indumentum of vegetative parts but is totally different in the structure and indumentum of reproductive parts. Both *M. albiflora* and *M. ustii* occupy the same geographical area in Panay, Aklan (Visayas), but *M. anisophylla* is found in Luzon, Mindoro, and Alabat Islands.

Additional specimens examined. PHILIPPINES. **Aklan:** Panay Island, betw. Naojon & Idio, 11°38′N, 122°06′E, *Alejandro 43* (UBT), *046* (UBT), *50* (BR, *Univ. Santo Tomas Hb.*), *51* (L), Nabas, Mt. Laserna, 11°49′N, 122°05′E, *Alejandro 20* (BR, UBT, *Univ. Santo Tomas Hb.*), *29* (NY, UBT, *Univ. Santo Tomas Hb.*, US), *30* (PNH, *Univ. Santo Tomas Hb.*), *31* (*Univ. Santo Tomas Hb.*), *36* (L, WAG), *37* (BM). **Antique:** [Panay Island] *McGregor 32450* (A). **Capiz:** [Panay Island] Jamindan, 11°25′N, 122°30′E, *Ramos & Edaño 31382* (US), Libacao, 11°28′N, 122°18′E, *Martelino & Edaño 35391* (A, L, NY), SW range of Mt. Baloy, Musay, 3–7 km N of Lublub, 11°05′N, 122°05′E, *Varadarajan 1531* (A, L, NY). **Iloilo:** *Reynoso et al. 17879* (A). **Negros Occidental:** Iglamgam, 09°50′N, 122°31′E, *F. Dias 29885* (A, NY).

3. **Mussaenda anisophylla** S. Vidal, Phan. Cuming. Philipp. 178. 1885. TYPE: Philippines. Albay: Luzon, 1841, [*H.*] *Cuming 918* (lectotype, designated by Jayaweera [1964: 108], BM [barcode] BM000827880!; isolectotypes, G [bc] 00436409 digital image!, K [bc] K000740919 digital image!). Figure 5.

Shrubs 2–7 m tall; young twigs green, densely hirsute, the trichomes more than 12-celled, brown; older branches with few to many lenticels, grayish white, glabrous or with few scattered trichomes. Leaf blades ovate to elliptic, 8.5–34 × 6–16 cm, membranaceous, hirsute above, densely hirsute, especially on midrib and veins underneath, margins ciliate, apex acuminate or acute to subcaudate, not conduplicate, base cuneate or attenuate; secondary veins in 7 to 15 pairs, prominulous above; petioles 1–5.5 cm, densely hirsute; stipules ovate, 7–15 × 4–8 mm at the base, deciduous, with dense indument on both sides, apex bifid 1/4 or ± half of length, the stipule lobes not diverging; colleters numerous, in continuous rows or in groups of 2 at the base. Inflorescences spreading, densely hirsute; bracts numerous, lanceolate, entire or trilobed, 6–9 × 1.5–3 mm, densely hirsute on both sides; flower pedicels 2 mm, with densely appressed or horizontal trichomes. Flowers odorless; calyx tubes cup-shaped to shortly tubular, 3–4 mm long, densely hirsute; calyx lobes linear, not recurved, 6–15 × 1–1.5 mm, hirsute outside, glabrous or hirsute inside, occasionally with a single calycophyll; colleters in 2 pairs per lobe, in sinuses between calyx lobes; calycophylls with blades elliptic to ovate, 5-nerved, 7.5–10 × 3.2–6 cm, white, sparsely pubescent on nerves of both sides, margins ciliate, apex acute, base cuneate; calycophyll stalks 1.5–2.7 cm, densely hirsute; corolla buds densely hirsute, remaining hirsute or with few scattered trichomes in open flowers, corolla tubes cylindrical, forming a distinctly swollen portion around anthers, 2.5–3 cm long, cream, without tuft of trichomes surrounding the opening; short-styled flower morphs with unstriated, ribbon-like trichomes internally to the base of anthers from the top; long-styled flower morphs with sparse, short, striate, ribbon-like trichomes internally to the short filaments from the top; corolla lobes broadly ovate, 5–6 × 6 mm wide, orange to yellow, abaxially hirsute, adaxially papillate, apex not recurved, with or without 1-mm filiform apical appendages; stamens inserted to distal 1/4 in short-styled flower morph, inserted around middle in long-styled flower morphs, filaments glabrous, anthers linear, 5–6.5 mm in short-styled flower morphs, 4.5–5.5 mm in long-styled flower morphs, glabrous, apex acute; pollen diameter to 16.65 μm, apertures 4; ovary 3–4 × 1.5–2 mm, style 3.5–4 mm in short-styled flower morphs, 22 mm in long-styled flower morphs, stigma 2–2.5 mm in short-styled flower morphs, 9 mm in long-styled flower morphs, smooth, not recurved and included in long-styled flower morphs. Fruits ellipsoid, 1.4–2 × 0.9–1.2 cm, with few warts, vertical ridges absent, green, sparsely hirsute, calyces persistent or deciduous; mesocarp 0.4–0.7 mm thick; fruiting pedicels 3–4 mm long, sparsely hirsute; seeds 0.63–0.73 × 0.33–0.63 mm; exotesta cells with 2 to 6 pores on the inner tangential walls, tuberculate thickenings slightly prominent or inconspicuous.

Local names. Ayon-a-kilat (Mar); Bodas (Igt); Buyon (Bis); Gagat, Gulugulpu, Kalkalpu (Ifg); Kahoy-dalaga (Tag); Mabiyun (Bng); Quiitogon (Kal); Talig-harap, Tinga-tinga (Tag), according to Alejandro (pers. obs.).

Phenology. Mussaenda anisophylla has been collected in flower from January to July and September to November, and in fruit from January to February, May to June and November to December.

Distribution and habitat. Mussaenda anisophylla has been found on Luzon, Mindoro, and Alabat Islands. It has been collected in low- or mid-altitude forests or from mossy forests, shaded ravines, streamsides, and on clay or sandy soils. Its known altitudinal extent is 100–800 m.s.m.

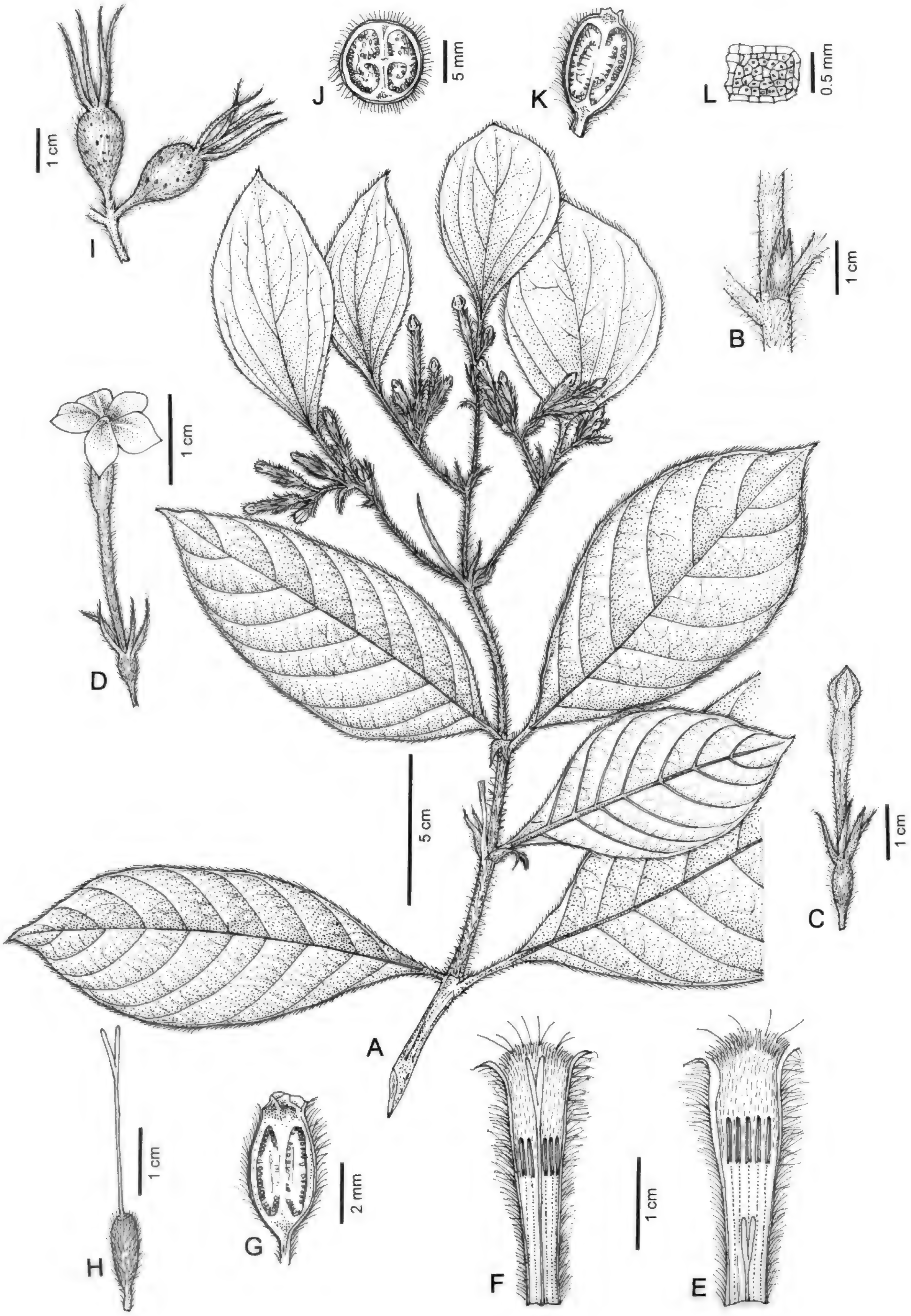

Figure 5. *Mussaenda anisophylla* S. Vidal. —A. Flowering branch. —B. Portion of stem with stipule. —C. Flower bud. —D. Open anthesal flower. —E. Short-styled flower morph, corolla tube dissected open in longitudinal section. —F. Long-styled flower morph, corolla tube dissected open in longitudinal section. —G. Longitudinal section through ovary. —H. Calyx, style, and stigma of long-styled flower morph, with the corolla and calyx lobes removed. —I. Two fruits with persistent calyces. —J, K. Fruit sections showing seed attachments on placentas in cross and longitudinal sections, respectively. —L. Seed. A–E are taken from *Celestino 7819* (PNH); F–H, from *Edaño 3500* (L); I–L, from *Sulit 7087* (PNH).

Discussion. Vidal (1885: 178) cited only the single collection "Cum. 918 Prov. Albay" in his description of *Mussaenda anisophylla*. Jayaweera (1964: 108) would later cite *Cuming 918* as "TYPE," also noting the collection as "BM–lectotype." As a Forest Bureau collection for the Philippines, one duplicate would have been deposited at PNH and was lost during World War II with the destruction of the herbarium. The surviving duplicate at BM is representative of the species, noted as type (sensu Art. 40.1) and lectotype (cf. Arts. 9.11 and 9.12, McNeill et al., 2012) by Jayaweera.

Jayaweera (1964) mistakenly annotated most fruiting specimens of *Mussaenda anisophylla* as *M. philippinensis*. Based on the fruits, the two species are strikingly disparate. The fruits of *M. anisophylla* are generally ellipsoid, larger to 2 × 1.2 cm, warty, sparsely hirsute, and with shorter, deciduous or persistent calyces. In *M. philippinensis*, the fruits are globose or ellipsoid, smaller to 1.5 × 0.8 cm, smooth, densely hirsute, and with the calyces always persistent and longer. *Mussaenda anisophylla* resembles *M. magallanensis* and *M. albiflora* based on the hirsute indument of vegetative and reproductive organs. However, *M. anisophylla* is characterized by longer leaf petioles to 3.5 cm, deeply bifurcate stipules, longer calyx lobes to 8 mm, larger calycophylls to 9.4 × 6 cm, densely hirsute inflorescence axes, wider corolla lobes to 6 mm, and with a denser hirsute indumentum before anthesis.

Additional specimens examined. PHILIPPINES. **Albay:** Bicol region, Brgy. Bulang, Mt. Malinao, 13°10′N, 123°25′E (*Univ. Santo Tomas Hb.*). **Bataan:** Lamao river, Mt. Marivales, 14°31′N, 120°29′E, *Merrill 2508* (A, MO, NY, PNH, US), *Meyer 3020* (NY), *Borromeo 25602* (US). **Batangas:** *Vidal 801* (A). **Ifugao:** 16°50′N, 121°10′E, *Conklin & del Rosario 72628* (PNH). **Kalinga:** Lubuagan, Mabuntot, 17°20′N, 121°11′E, *del Rosario & Cordero 96180* (PNH, US); Balbalan, 17°25′N, 121°11′E, *Celestino 7819* (A, PNH). **Laguna:** Luzon Island, Los Banos, Mt. Makiling, 14°10′N, 121°13′E, *Canicosa 9730* (PNH), *Elmer 17481* (A, MO, NY), *Stern 2185* (L, PNH), *Sulit 7087* (A, PNH), *8232* (PNH). **Mindoro [Occidental]:** Paluan, 13°25′N, 120°28′E, *Ramos 39509* (US); Mt. Ilong, *Edaño 373* (PNH), *Edaño 3290* (A); Mt. Halcon, 13°15′N, 120°59′E, *Edaño 3500* (L, MO), *114* (PNH), *Edaño & Ramos 40589* (PNH, US), *Ramos & Edaño 40703* (A); Sabang River, 13°30′N, 120°58′E, *Reed 93778* (PNH); Lauaan, Abra de Ilog, 13°26′N, 120°44′E, *Sulit 13813* (PNH); vic. Puerto Galera, *Bartlett 13459* (A). **Mountain:** Banaue, Amganad, Brgy. Bulang, 16°53′N, 121°04′E, *Banlugan 72607* (PNH), Mt. Hagada, Brgy. Pula, 16°52′N, 121°54′E, *Reynoso et al. 14506* (A). **Nueva Viscaya:** Dupax, 16°17′N, 121°04′E, *Merrill 299* (US). **Pangasinan:** Labrador, Mt. San Isidro, 16°01′N, 120°09′E, *Fenix 29851* (NY). **Quezon:** Alabat Island, *Merrill 10437* (A, L, PNH, US), *Ramos & Edaño 48110* (NY); Tayabas, Lucban, 14°07′N, 121°33′E, *Elmer 9154* (MO, NY, US), Mt. Binuang, 14°55′N, 121°55′E, *Ramos & Edaño 28783* (A), *28687* (A), Mt. Tulaog, 14°46′N, 121°37′E, *Ramos & Edaño 29093* (A). **Zambales:** *Ramos 5044* (NY).

4. **Mussaenda attenuifolia** Elmer, Leafl. Philipp. Bot. 5: 1875. 1913. TYPE: Philippines. Agusan del Norte: Mindanao, Cabadbaran, Mt. Urdaneta, 09°07′N, 125°33′E, July 1912, *A. D. E. Elmer 13304* (lectotype, designated by Jayaweera [1964: 110], A [barcode] 00096195!; isolectotypes, BISH [bc] 1004481 digital image!, BRIT [bc] 23828 digital image!, CAS [bc] 0007108 digital image!, E [bc] 00502294 digital image!, GH [bc] 00096194 digital image!, K [bc] K000740918 digital image!, L!, MO [bc] 000716845!, NY [bc] 00132305!, U [bc] 0117320 digital image!, US [bc] 001051173!).

Shrubs 5 m tall; young twigs greenish brown, densely pubescent, the trichomes less than 12-celled, brown; older branches lenticellate, grayish white, glabrous. Leaf blades oblanceolate or elliptic, 7–20 × 3.5–6.7 cm, membranaceous, sparsely pubescent above, densely pubescent especially on midrib and veins underneath, margins ciliate, apex acuminate or subcaudate, not conduplicate, base attenuate; secondary veins in 10 to 14 pairs, prominulous above; petioles 0.5–1.5 cm, densely pubescent; stipules triangular or ovate, 5–11 × 4.5–5.5 mm at the base, deciduous, with dense indument on both sides; apex bifid ± half of length, the stipule lobes not diverging; colleters numerous, in continuous rows at the base. Inflorescences spreading, densely pubescent; bracts few, linear to narrowly lanceolate, entire, 5–8 × 1–2.8 mm, densely pubescent underneath, pubescent above; flower pedicels 1–1.5 mm, with sparse appressed trichomes. Flowers odorless; calyx tubes cup-shaped to shortly tubular, 3–4.5 mm, densely pubescent; calyx lobes lanceolate, not recurved, 3 × 0.8–1.2 mm, pubescent on both sides, occasionally with a single calycophyll; colleters as 1 or 2 pairs per lobe, in sinuses between calyx lobes; calycophylls with blades ovate or elliptic to ovate, 5-nerved, 8–13 × 5–8 cm, white or cream, sparsely pubescent along nerves of both sides, margins ciliate, apex acuminate, base attenuate; calycophyll stalks 2–3 cm, densely pubescent; corolla buds densely pubescent, remaining pubescent or only in upper half and with few scattered trichomes below in open flowers; corolla tubes cylindrical, forming a distinctly swollen portion around anthers, 2.7–4 cm long, yellowish white, with tuft of trichomes surrounding the opening; long-styled flower morphs with sparse short, striate, ribbon-like trichomes internally to base of anthers or to the short filaments from the top; short-styled flower morphs not seen; corolla lobes ovate or broadly elliptic, 4–5 ×

2.5–4 mm, orange to yellow, abaxially pubescent, adaxially papillate, apex not recurved, with or without 1-mm filiform apical appendages; stamens inserted around middle in long-styled flower morphs, filaments glabrous, anthers linear, 4–5 mm in long-styled flower morphs, glabrous, apex obtuse; pollen diameter to 15.75 μm, apertures 4; ovary 3–3.5 × 2–2.5 mm, style 18 mm in long-styled flower morphs, stigma 7.5–8 mm, smooth, not recurved, included in long-styled flower morphs. Fruits ellipsoid to obovoid, 1.2–2 × 0.9–1 cm, smooth, with slightly prominent vertical ridges, green, calyces deciduous, sparsely pubescent; mesocarp 0.3–0.5 mm thick; fruiting pedicels 4–6 mm, sparsely pubescent; seeds 0.64–0.77 × 0.43–0.63 mm; exotesta cells with 2 to 6 pores on inner tangential walls, tuberculate thickenings absent.

Local names. Bungog (Mbo); Buway (Bgb), according to Alejandro (pers. obs.).

Phenology. The collector of the type, Elmer, collected flowers and fruits in July 1912.

Distribution and habitat. *Mussaenda attenuifolia* is endemic to the southernmost island group of Mindanao, from the province of Agusan del Norte. It has been collected from low- and mid-altitudes on Mount Urdaneta, along creeksides, from altitudes of 150–450 m.s.m. This species appears to have a restricted distribution on Mount Urdaneta, Mindanao, and has not been re-collected since 1912.

Discussion. Elmer (1913: 1875) cited his "Type specimen number" as 13304, and Jayaweera (1964: 110) would later specify "A–lectotype; GH, NY, US–isotypes." Additional isolectotypes (BISH, BRIT, CAS, E, K, L, MO, and U) have been found, although Elmer's type at PNH was destroyed, along with the herbarium during World War II.

Jayaweera (1964) regarded this species as closely related to *Mussaenda palawanensis* based on the morphology of stipules, shape of corolla lobes, and number of seed perforations. However, the two species are characterized by remarkable differences based on these similarities. *Mussaenda attenuifolia* has smaller, triangular or ovate, not diverging stipules, and shorter, ovate or elliptic corolla lobes to 5 mm long, with short filiform appendages to 1 mm. In contrast, *M. palawanensis* is marked by larger, triangular, sometimes diverging stipules, and longer, ovate corolla lobes to 10 mm long with long filiform appendages to 2.5 mm. *Mussaenda attenuifolia* is rather distinctive by its large calycophylls, which are strictly attenuate at the base, by its corolla tubes to 4.5 mm long, and by the smooth surfaces of its fruits.

5. Mussaenda benguetensis Elmer, Leafl. Philipp. Bot. 1: 13. 1906. TYPE: Philippines. Benguet: Luzon, Baguio, 16°24′N, 120°35′E, Mar. 1904, *A. D. E. Elmer 5935* (lectotype, designated here, NY [barcode] 00132306!; isolectotypes, K [bc] K000740917 digital image!, US [bc] 000137845 digital image!). Figure 6.

Shrubs or trees, 1–5 m tall; young twigs greenish brown, sparsely to densely hirsute, the trichomes more than 12-celled, brown; older branches with few lenticels, reddish or grayish brown, with few scattered trichomes. Leaf blades ovate to elliptic or lanceolate, 6–11 × 3–5 cm, subcoriaceous, sparsely pubescent above, densely pubescent, especially on the midrib and veins underneath, margins ciliate, apex acute or acuminate to subcaudate, not conduplicate, base cuneate or obtuse; secondary veins in 8 to 11 pairs, prominulous above; petioles 0.5–2 cm, densely hirsute; stipules broadly oblong or ovate, 7–10 × 6.8–9 mm at the base, persistent, abaxially with dense indument, adaxially with sparse indument only at the base; apex bifid ± half to 3/4 length, the stipule lobes distinctly diverging; colleters numerous, in groups of 2 at the base. Inflorescences congested, densely hirsute; bracts few, lanceolate, entire to trilobed, 4–13 × 0.7–2 mm, densely pubescent underneath, glabrous or sparsely pubescent above; flower pedicels 1–2 mm, with densely appressed trichomes. Flowers rarely 6-merous, sweet-scented; calyx tubes cup-shaped to shortly tubular, 4–7 mm, densely pilose; calyx lobes subulate, not recurved, 9–10 × 2 mm, pilose on both surfaces, occasionally with a single calycophyll; colleters as 2 to 4 pairs per lobe, in sinuses between calyx lobes or in a row at the base adaxially; calycophylls with blades ovate or elliptic to ovate, 5-nerved, 3–5.2 × 2–4 cm, white, sparsely pubescent along nerves of both surfaces, margins ciliate, apex acuminate, base attenuate; calycophyll stalks 0.4–0.8 cm, densely pilose; corolla buds densely pilose, variably pilose in open flowers; corolla tubes infundibular, the swollen portion around anthers indistinct, 3–3.7 cm long, yellowish or greenish white, with tuft of trichomes surrounding the opening; in short-styled flower morphs with dense, long, unstriate, ribbon-like trichomes internally to the base of anthers or to the short filaments from the top; in long-styled flower morphs with mixed or alternating variably globular trichomes and short, verrucose, straplike trichomes internally to the short filaments from the top; corolla lobes ovate or broadly elliptic, 5–8 × 4–6 mm, yellow, abaxially pilose, adaxially papillate, apex recurved or not, with or without 1.5-mm filiform apical appendages; stamens inserted to

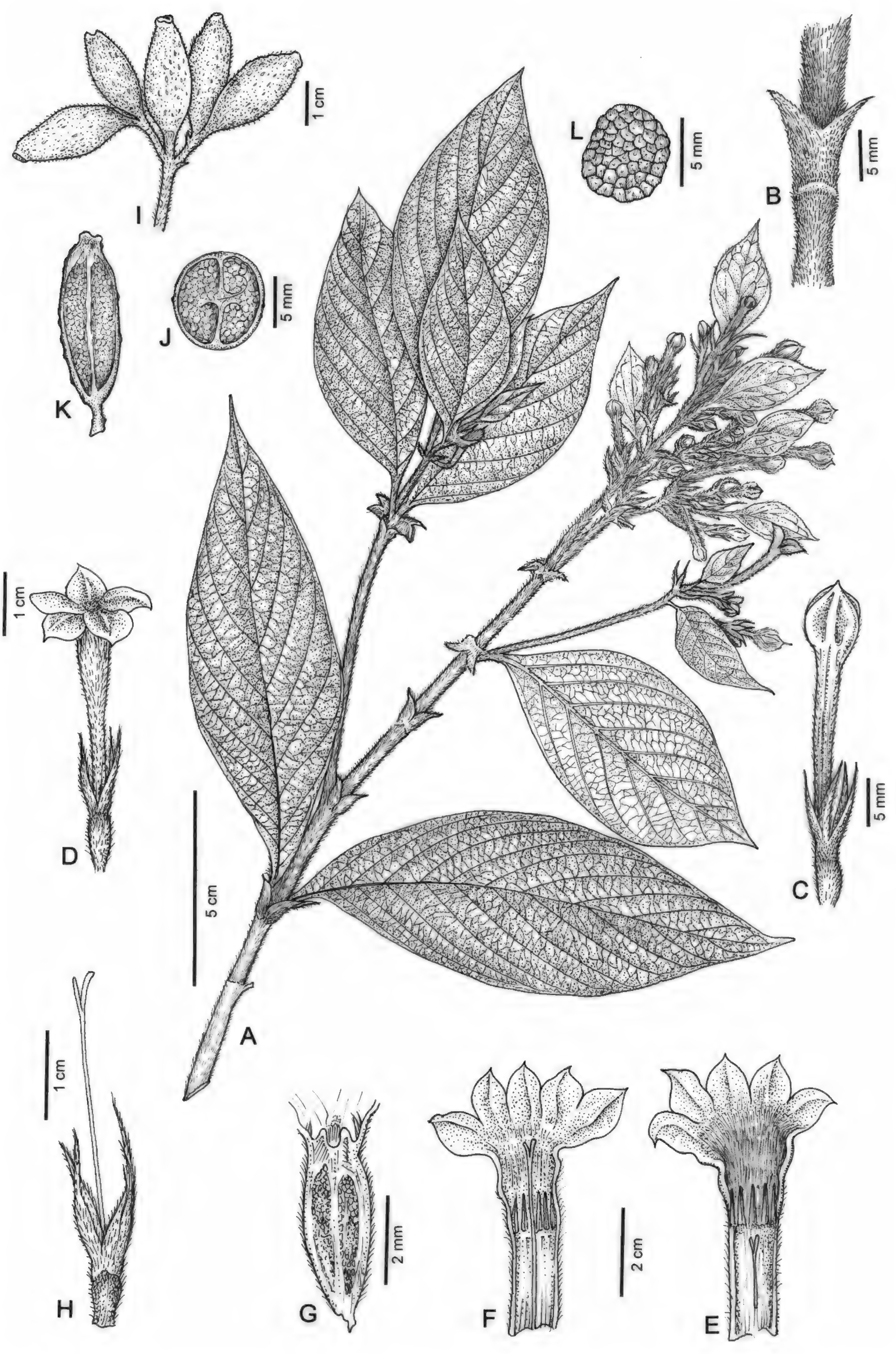

Figure 6. *Mussaenda benguetensis* Elmer. —A. Flowering branch. —B. Portion of stem with stipule. —C. Flower bud. —D. Open anthesal flower. —E. Short-styled flower morph, corolla tube dissected open in longitudinal section. —F. Long-styled flower morph, corolla tube dissected open in longitudinal section. —G. Longitudinal section through ovary. —H. Calyx, style, and stigma of long-styled flower morph, with the corolla removed. —I. Five fruits. —J, K. Fruit sections showing seed attachments on placentas, in cross and longitudinal sections, respectively. —L. Seed. A–D are taken from *Conklin & del Rosario 72703* (PNH); E, from *Alejandro 110* (*Univ. Santo Tomas Hb.*); F–L, from *Alejandro 108* (UBT).

distal 1/4 in short-styled flower morphs, around middle or to distal 1/4 in long-styled flower morphs, filaments glabrous, anthers linear, 5–6 mm in short-styled flower morphs, 5–5.5 mm in long-styled flower morphs, glabrous, apex acute or obtuse; pollen diameters to 19.8 μm, apertures 4, rarely 3; ovary 3.5–4.5 × 2–2.5 mm, style 4–7 mm in short-styled flower morphs, 22–25 mm in long-styled flower morphs; stigma 2–3 mm in short-styled flower morphs, 5–6.5 mm in long-styled flower morphs, smooth, not recurved and included in long-styled flower morphs. Fruits narrowly ellipsoid, 2–3 × 0.6–0.9 cm, with dense warts, without vertical ridges, brown, sparsely pubescent, calyces deciduous; mesocarp 0.3–0.5 mm thick; fruiting pedicels 2–4 mm, densely pubescent; seeds 0.7–0.77 × 0.53–0.63 mm; exotesta cells with 4 to 9 pores on the inner tangential walls, tuberculate thickenings slightly prominent.

Local names. Bilaw (Igt); Elado, Gelido, Kalkalpu (Ifg); Otoy-otoy (Igt); Salimaguok (Tng); Sangsang, Ugwa-ugwa (Igt); Wuguawugua (Bon), according to Alejandro (pers. obs.).

Phenology. Mussaenda benguetensis has been observed to flower from January to June, August, and October to December, and in fruit from January to February, June, and October to December.

Distribution and habitat. Mussaenda benguetensis is known from Ifugao, Benguet, and Mountain Provinces on Luzon Island. It has been collected from secondary or primary forests, along roadsides, on ravines, from loamy or sandy soils, and from elevations ranging from 300 to 2300 m.s.m.

Discussion. Although documented by Jayaweera (1964: 112), the PNH holotype of *Mussaenda benguetensis* was not encountered in the recent investigation of Rubiaceae types at PNH and is presumed to have been destroyed during World War II. Therefore, the isotype of *M. benguetensis* at the NY herbarium is here designated as the lectotype, and isolectotypes in K and US have also been found.

Mussaenda benguetensis is distinct from other Philippine *Mussaenda* species by its prominently diverging, broadly oblong or ovate stipules; by its small, crowded leaves 6–11 cm long; by its sweet-scented flowers, with mixed or alternating globular and strap-shaped trichomes inside the corolla tubes in long-styled flower morphs; and by the narrowly ellipsoid fruits to 3 cm long. Like *M. benguetensis*, both *M. chlorontha* and *M. lanata* are also found in Benguet, Ifugao, and Mountain Provinces of Luzon. However, *M. benguetensis* differs from the other two based on its distinct features.

Additional specimens examined. PHILIPPINES. **Benguet:** Tuba, Cabuyao, Mt. Sto. Tomas, 16°23′N, 120°33′E, *Alejandro 108* (UBT), *111* (PNH, *Univ. Santo Tomas Hb.*), *Elmer 6536* (NY), *Garcia 34977* (PNH), *Quisumbing 2193* (PNH), *Sinclair & Edaño 55365* (PNH), *9689* (L, PNH, US), *Steiner 267* (US); Baguio, 16°24′N, 120°35′E, *Clemens 51845* (A, US), *Elmer 8431* (A, NY), *9535* (PNH), *Steiner 22585* (PNH), *35835* (PNH), *41617* (PNH), *Topping 64* (US), *Valbuena & Lopez 91899* (PNH), *Walker 7501* (US), *Williams 1006* (A, NY); Kabayan, Mt. Libbung, 16°38′N, 120°50′E, *Mendoza 40936* (PNH); Papuai, *Santos 31880* (NY), *Santos 34* (A, MO); Mt. Pulog, 16°36′N, 120°54′E, *Alejandro 110* (PNH, *Univ. Santo Tomas Hb.*), *Mendoza 104012* (PNH). **Ifugao:** Luzon Island, Banaue, Bayninnan, 17°11′N, 120°45′E, *Conklin & Buwaya 80640* (PNH); Sumigar, *Conklin & del Rosario 72703* (A, L, PNH); Mt. Polis, 16°48′N, 121°07′E, *Alejandro 107* (BR, L, NY, WAG), *Steiner 41580* (PNH, US). **Mountain:** Bontoc, Besao, Barrio Agawa, 17°04′N, 120°52′E, *Santos 5497* (US); Mt. Nangaoto, *Sulit 7722* (BR, PNH).

6. **Mussaenda chlorantha** Merr., Philipp. J. Sci. 8(Pt. C): 47. 1913. TYPE: Philippines. Benguet: Luzon Island, Mt. Tonglon, 16°23′N, 120°38′E, May 1911, *E. D. Merrill 770* (lectotype, designated by Jayaweera [1964: 113], US [barcode] 001310695!; isolectotypes, FR [bc] 0030824 digital image!, M [bc] 0198427 digital image!, U [bc] 0041553 digital image!). Figure 7.

Trees 5–8 m tall; young twigs green, pilose, trichomes less than 12-celled, brown; older branches with few to many lenticels, reddish or grayish brown, glabrous. Leaf blades broadly ovate, 10–18 × 5–12 cm, subcoriaceous, sparsely pubescent on both surfaces, especially on midrib and veins underneath, margins ciliate, apex shortly acuminate, not conduplicate, base cuneate or attenuate; secondary veins in 7 to 13 pairs, prominulous above; petioles 1.5–4 cm, pubescent; stipules ovate or triangular, 7–10 × 3.5–6.5 mm at the base, persistent or deciduous, with dense pilose indument on both sides; apex entire or bifid 1/4 length, the stipule lobes not diverging; colleters numerous, in continuous rows or in groups of 2 at the base. Inflorescences spreading, densely pilose; bracts few, linear-lanceolate or ovate-lanceolate, entire or trilobed, 4–8 × 1.5–3 mm, densely pubescent underneath, pubescent above; flower pedicels 1.5–2 mm, with densely appressed trichomes. Flowers odorless; calyx tubes cup-shaped to shortly tubular, 5 mm long, densely pilose; calyx lobes lanceolate or subulate, not recurved, 8–10 × 2–2.5 mm, pilose on both surfaces, occasionally with a single calycophyll; colleters 1 pair per lobe, in sinuses between calyx lobes; calycophylls with blades broadly ovate, 5-nerved, 5–8 × 3.5–5 cm, white, sparsely pubescent along nerves on both surfaces, margins ciliate, apex acute or acuminate, base cuneate; calycophyll stalks 1.5–2 cm, densely pilose; corolla buds and open flowers densely pilose;

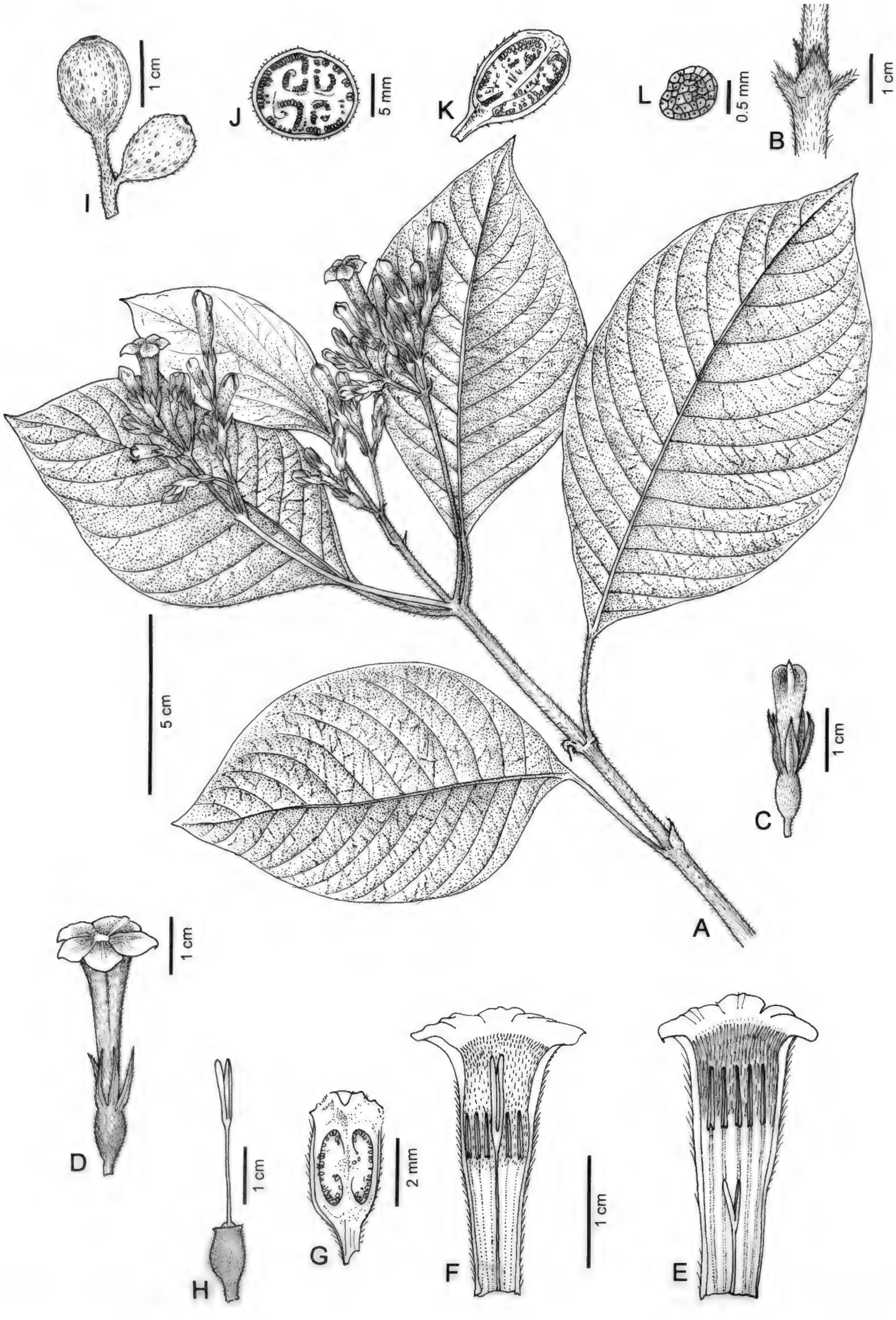

Figure 7. *Mussaenda chlorantha* Merr. —A. Flowering branch. —B. Portion of stem with stipule. —C. Flower bud. —D. Open anthesal flower. —E. Short-styled flower morph, corolla tube dissected open in longitudinal section. —F. Long-styled flower morph, corolla tube dissected open in longitudinal section. —G. Longitudinal section through ovary. —H. Calyx, style, and stigma of long-styled flower morph, with the corolla and calyx lobes removed. —I. Two fruits. —J, K. Fruit sections showing seed attachments on placentas, in cross and longitudinal sections, respectively. —L. Seed. A–E are taken from *Santos 31725* (NY); F–L, from *Alejandro 109* (UBT).

corolla tubes infundibular, swollen portion around anthers indistinct, 2–2.3 cm, brownish green, without tuft of trichomes surrounding the opening; short-styled flower morphs with dense, long, unstriated, ribbon-like trichomes internally to the base of anthers from the top; long-styled flower morphs with sparse short, striate, ribbon-like trichomes internally to the short filaments from the top; corolla lobes ovate or broadly elliptic, 4–5 × 5–6 mm, orange or yellow, abaxially pilose, adaxially papillate; apex not recurved, without filiform apical appendages; stamens inserted to distal 1/4 in short-styled flower morphs, around middle in long-styled flower morphs, filaments glabrous, anthers linear, 5–6 mm in short-styled flower morphs, 4.5–5 mm in long-styled flower morphs, glabrous or with few scattered trichomes, apex acute or obtuse; pollen diameters to 16.2 μm, apertures 4; ovary 3–3.5 × 1.5–2.5 mm, style 5 mm in short-styled flower morphs, 15–17 mm in long-styled flower morphs, stigma 1.5 mm in short-styled flower morphology, 7–8 mm, smooth, not recurved and included in long-styled flower morphs. Fruits obovoid, 1–1.4 × 0.9–1.1 cm, with sparse warts, without vertical ridges, green, calyces deciduous, glabrous or with few scattered hairs; mesocarp 0.4–0.6 mm thick; fruiting pedicels 3–3.5 mm, glabrous or sparsely pubescent; seeds 0.7–0.83 × 0.5–0.56 mm, exotesta cells with 4 to 12 pores on the inner tangential walls, tuberculate thickenings absent.

Local names. Buyon (Bis); Buyon-kahoy (Tag), according to Alejandro (pers. obs.).

Phenology. Mussaenda chlorantha has been observed to flower in February, April to June, and October to November, and in fruit from October to November.

Distribution and habitat. Mussaenda chlorantha is known from Luzon Region/Island, from Rizal, Pampanga, Ifugao, Benguet, and Mountain Provinces, and to the south in the Visayas Islands, from Negros Oriental Province. It has been collected in mid- to high-altitude evergreen forests, from ravines, on riverside banks, on clay-loamy soils, and from elevations of 400–2040 m.s.m.

Discussion. Merrill mentioned only the one collection *Merrill 770* in his 1913 protologue, the holotype of which was destroyed at PNH during World War II. Jayaweera (1964: 113) identified a surviving duplicate at US as "lectotype," and the authors have seen other duplicates (FR, M, and U) that are designated here as isolectotypes.

Merrill (1913) and Jayaweera (1964) regarded *Mussaenda chlorantha* as closely similar to *M. macrophylla* Wall., but did not mention particular similarities between the two species. In terms of the indumentum, size, and shape of reproductive structures, the two species are vastly dissimilar. *Mussaenda chlorantha* rather resembles *M. lanata* in the form of the corolla bud. However, *M. chlorantha* has a different indumentum type (pilose vs. hirsute in *M. lanata*) and obviously longer corolla tubes of a different color (to 2.3 cm and brownish green vs. 1.5 cm and yellowish white). Other distinctive characters of *M. chlorantha* include the broadly ovate leaves, ovate corolla lobes, and strict tree habit. This species is common and can be expected from other provinces on Luzon Island, extending southward to Negros Oriental in the Visayas Island group.

Additional specimens examined. PHILIPPINES. **Benguet:** Benguet, Tuba, Cabuyao, Mt. Sto. Tomas, 16°23′N, 120°34′E, *Alejandro 109* (UBT, *Univ. Santo Tomas Hb.*); Pauai, *Santos 31725* (L, NY); Twin Peaks, *Elmer 6318* (NY), *6381* (US). **Ifugao:** Mt. Polis, 16°48′N, 121°07′E, *Celestino 7879* (L). **Mountain:** Bontoc, 17°04′N, 120°58′E, *Vanoverbergh 190* (A, L, MO). **Negros Oriental:** Dumaguete, Mt. Cuernos, 09°18′N, 123°18′E, *Elmer 9966* (A, MO, NY). **Pampanga:** Camp Stotsenburg, Mt. Pinatubo, 15°09′N, 120°32′E, *Elmer 21940* (MO, NY, PNH). **Rizal:** Luzon, Mt. Irig, 14°36′N, 121°11′E, *Ramos 42135* (BR).

7. **Mussaenda grandibracteata** Alejandro, sp. nov. TYPE: Philippines. Occidental Mindoro: Magsaysay, San Nicolas, 12°21′N, 121°06′E, 15 Oct. 2002, *G. J. D. Alejandro & J. C. Castro 14* (holotype, PNH!; isotypes, NY [barcode] 006888885!, *Univ. Santo Tomas Hb.*!). Figure 8.

Haec species ab aliis speciebus generis bracteis et bracteolis numerosis grandibus luteoviridibus, stipulis integris vel breviter bifidis et tubo calycis brevissimo differt.

Shrubs 1.5–3 m tall; young twigs greenish brown, glabrous; older branches with few to many lenticels, reddish or grayish brown, glabrous. Leaf blades elliptic to widely obovate, 7–22.5 × 3.2–10.3 cm, membranaceous, glabrous above, with few scattered minute trichomes underneath, margins glabrous, apex acute or acuminate, not conduplicate, base cuneate or long attenuate, secondary veins in 9 to 11 pairs, prominulous above; petioles 0.4–3.5 cm, glabrous; stipules ovate, 7–9 × 4–5.5 mm at the base, deciduous, abaxially pubescent, adaxially with dense indument only at the base; apex entire or bifid 1/8 of length, the stipule lobes not diverging; colleters numerous, in groups of 2 at the base. Inflorescences spreading or congested, glabrescent; bracts and bracteoles numerous, about 10 or more per inflorescence axes, yellow-green, lanceolate, entire or trilobed, 7–13 × 2.5–5 mm,

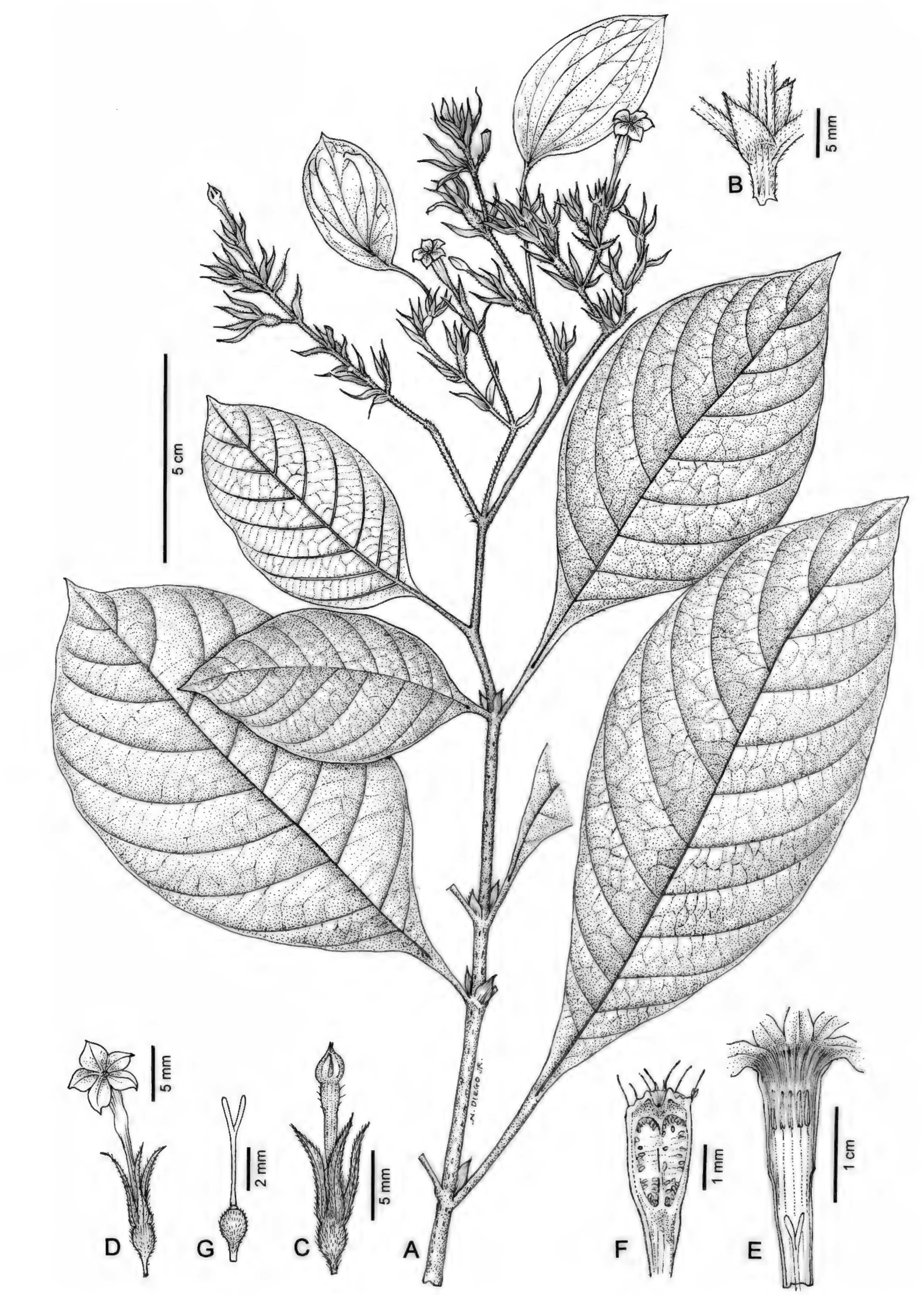

Figure 8. *Mussaenda grandibracteata* Alejandro. —A. Flowering branch. —B. Portion of stem with stipules. —C. Flower bud. —D. Open anthesal flower. —E. Short-styled flower morph, corolla tube dissected open in longitudinal section (long-styled flower morph not seen). —F. Longitudinal section through ovary. —G. Calyx, style, and stigma of short-styled flower morph, with the corolla and calyx lobes removed. A–G from the type *Alejandro & Castro 14* (PNH).

sparsely pubescent underneath, glabrous or sparsely pubescent above; flower pedicels 1.5–2 mm, glabrous or with few scattered trichomes. Flowers odorless; calyx tubes, 1.5–2.5 mm long, glabrescent; calyx lobes linear to lanceolate, not recurved, 7–10 × 1–1.5 mm, pubescent on both sides, occasionally with a single calycophyll; colleters as 1 pair per lobe, in sinuses between calyx lobes, or sometimes absent; calycophylls with blades elliptic, 5-nerved, 5.5–7.4 × 3.2–4.8 cm, white or cream, glabrous above, glabrous or pubescent only along nerves beneath, margins glabrous, apex acute or acuminate, base cuneate; calycophyll stalks 1.5–2 cm, glabrous or with few scattered short trichomes; corolla buds puberulous, becoming glabrous or with few scattered trichomes in open flowers; corolla tubes cylindrical, forming a distinctly swollen portion around anthers, 2.2–2.4 cm long, yellowish green, with tuft of trichomes surrounding the opening; short-styled flower morphs with dense, long, unstriate, ribbon-like trichomes internally to the base of anthers from the top; long-styled flower morphs not seen; corolla lobes ovate to elliptic, 3–3.5 × 3–4 mm, yellow or yellow-orange, abaxially glabrous or puberulous, adaxially papillate, apex not recurved, without filiform apical appendages; stamens inserted to distal 1/4 in short-styled flower morphs, filaments glabrous, anthers linear, 3–4.5 mm in short-styled flower morphs, glabrous, apex acute; pollen diameters to 15.75 μm, apertures 4; ovary 1.5–2.4 × 1.5–2 mm, style 3–5 mm in short-styled flower morphs; stigma 1–2 mm in short-styled flower morphs, smooth. Fruits not seen.

Local name. Banay-dagat (Myn), according to Alejandro (pers. obs.).

Etymology. The specific epithet of the new species refers to its large bracts.

Phenology. *Mussaenda grandibracteata* was observed to flower from September to November, but fruits were not seen.

Distribution and habitat. *Mussaenda grandibracteata* has been collected from the province of Mindoro Occidental in the central Philippines and from the province of Davao del Sur to the south in the Mindanao Region. A geographical disjunction is obvious, but probably this species can be found also in the intervening provinces. The new species is known from low-altitude secondary and primary forests, on slopes near the road, on sandy or ultramafic soils, at altitudes from 25 to 300 m.s.m. The Philippine Plant Inventory Team (PPIT) of the PNH herbarium recently botanized the locality and found the type specimen (Mindoro Occidental: San Nicolas).

IUCN Red List category. *Mussaenda grandibracteata* is assessed as Endangered or EN, C2a(i), according to IUCN (2001) criteria. The population size is estimated to number fewer than 2500 mature individuals. A continuing decline is projected, with no subpopulation estimated to contain more than 250 mature individuals or even more than 50. Suitable habitats for *M. grandibracteata* are threatened by human land use in Magsaysay (Mindoro Occidental) and are threatened by human activity, as one subpopulation is located on the much visited Mount Apo (Davao del Sur).

Discussion. *Mussaenda grandibracteata* is distinguished by having numerous, large, yellow-green bracts that subtend the flowers, by the entire or shortly bifid apices of the stipules, and by the much reduced calyx tubes only to 2.5 mm long. This species is somewhat similar to *M. magallanensis* in the morphology of the leaves and flowers. However, the vegetative and reproductive parts of *M. grandibracteata* are more or less glabrous, whereas in *M. magallanensis* these parts are densely hirsute. *Mussaenda scandens* is the only other Philippine species that has comparably short calyx tubes to 1.8–2.5 mm, and glabrescent young twigs and infloresences. *Mussaenda grandibracteata* differs from *M. scandens* by its non-conduplicate leaf apices, minimal bifurcation of stipules to one eighth of their length, numerous and wider bracts, and long calyx lobes to 7–10 mm. Both species occur on Mount Apo of Davao del Sur, but *M. grandibracteata* extends to Mindoro Occidental, while *M. scandens* is strictly distributed in the provinces of Mindanao.

Paratypes. PHILIPPINES. **Davao del Sur:** Mindanao, Mt. Apo, 07°00′N, 125°16′E, 10 Nov. 2002, *G. D. Alejandro 17* (PNH, *Univ. Santo Tomas Hb.*). **Mindoro Occidental:** San Nicolas, Magsaysay, 12°21′N, 121°06′E, 20 Sep. 2002, *D. M. Madulid & J. C. Castro 13* (US), *15* (WAG), *16* (L, UBT).

8. Mussaenda grandifolia Elmer, Leafl. Philipp. Bot. 1: 12–13. 1906. TYPE: Philippines. Paragua: Pt. Separation, 09°05′N, 118°07′E, Feb. 1903, *E. D. Merrill 817* (lectotype, designated by Jayaweera [1964: 115], US [barcode] 000435787!).

Shrubs 3–4 m tall; young twigs greenish brown, densely velvety, the trichomes less than 12-celled, white to brownish; older branches with few lenticels, grayish brown, glabrous or with few scattered trichomes. Leaf blades ovate or elliptic to obovate, 16–32 × 7.5–15 cm, membranaceous, sparsely velvety adaxially, densely velvety abaxially, especially on the midrib and veins, margins ciliate, apex acute, not conduplicate, base cuneate, or long attenuate; secondary veins in 11 to 14 pairs, prominulous above; petioles 1.5–3 cm, densely velvety; stipules triangular, 7 × 3–4 mm at the base, deciduous, abaxially with dense indument, adaxially with sparse indument; apex entire or bifid, 1/8 of length, the stipule lobes not diverging; colleters numerous, in continuous rows at the base. Inflorescences spreading, densely velvety; bracts few, ovate, entire, 1.5–2 × 0.5–1.5 mm, densely velvety on both sides; pedicels 1.5–2 mm, with appressed trichomes. Flowers odorless; calyx tubes cup-shaped to shortly tubular, 4 mm long, densely velvety; calyx lobes lanceolate or subulate, not recurved, 0.8–2.5 × 0.7–1 mm, velvety on both sides, occasionally with a single calycophyll; colleters as 1 to 3 pairs per lobe, in sinuses between calyx lobes; calycophylls with blades broadly ovate, 5-nerved, 4.5–7 × 4–4.5 cm, yellowish white, sparsely pubescent along nerves on both surfaces, margins ciliate, apex acuminate, base attenuate; calycophyll stalks 1.5–2.5 cm, densely pubescent; corolla buds and open flowers densely velvety; corolla tubes infundibular, swollen portion around anthers indistinct, 2.5–2.9 cm long, yellowish white, without tuft of trichomes surrounding the opening, internally glabrous in long-styled flower morphs, short-styled flower morphs not seen; lobes ovate, 4 × 3–4 mm, yellow, abaxially velvety, adaxially papillate; apex not recurved, without filiform apical appendages; stamens inserted around the middle in long-styled flower morphs, filaments glabrous, anthers linear, 3.2–4.2 mm in long-styled flower morphs, glabrous, apex acute; pollen diameters to 14.85 μm, apertures 4; ovary 4.5 × 2–2.5 mm, style 22 mm in long-styled flower morphs, stigma 10 mm, smooth, not recurved and included in long-styled flower morphs. Fruits ellipsoid, 1–1.3 × 0.8–0.9 cm, without warts and vertical ridges, green, calyces persistent, densely velvety; mesocarp 0.7–0.9 mm thick; fruiting pedicels 2–2.5 mm, densely velvety; seeds 0.64–0.77 × 0.43–0.53 mm; exotesta cells with 2 to 4 pores on the inner tangential walls, tuberculate thickenings absent.

Local names. Buyon-buyon (Pal); Malabuyon (Tag), according to Alejandro (pers. obs.).

Phenology. Mussaenda grandifolia has been collected in flower and fruit in February and March.

Distribution and habitat. Mussaenda grandifolia is endemic to Palawan, from Paragua Province. It has been collected in lower montane forest, on ultramafic slopes, and at altitudes from 40 to 550 m.s.m.

Discussion. Merrill mentioned only one collection, *Merrill 817*, in his 1906 protologue. As a Bureau of Science collection for the flora of the Philippines, one duplicate would have been deposited at PNH and destroyed along with the herbarium in World War II. The surviving duplicate at US was identified as "Type" in Jayaweera's treatment of Philippine *Mussaenda* (1964: 112) and specified as "US–lectotype" (1964: 115).

This species is the only Philippine representative with a velvety indumentum on the vegetative and reproductive parts and without unicellular trichomes inside the corolla tube. *Mussaenda grandifolia* appears to have a restricted and endemic distribution in Palawan. Its most recent collection was in 1984 at Mount Beaufort deposited at PNH.

Additional specimens examined. PHILIPPINES. **Palawan:** Mt. Beaufort, NNW spur, E side, 08°46′N, 117°47′E, *Ridsdale 35* (PNH); San Antonio Bay, 08°39′N, 117°36′E, *Merrill 865* (US).

9. **Mussaenda lanata** C. B. Rob., Philipp. J. Sci. 6(Pt. C): 357. 1911. TYPE: Philippines. Benguet: Luzon, Antimok, 16°25′N, 120°35′E, May 1909, *E. D. Merrill 6681* (lectotype, designated by Jayaweera [1964: 117], US [barcode] 000711179!). Figure 9.

Shrubs or trees, 2–5 m tall; young twigs green to grayish brown, densely hirsute, the trichomes more than 12-celled, white to brown; older branches with few to many lenticels, reddish or grayish brown, glabrous or with few scattered trichomes. Leaf blades ovate or obovate to orbicular, 10.5–30 × 6.5–16.5 cm, membranaceous to subcoriaceous, sparsely to densely pubescent above, densely pubescent, especially on midrib and veins underneath; margins ciliate; apex abruptly acute to acuminate, not conduplicate; base cuneate to obtuse; secondary veins in 8 to 13 pairs, prominulous above; petioles 1–8 cm long, densely hirsute. Stipules triangular or ovate, 8–18.5 × 5–8.5 mm at the base, deciduous, abaxially with dense indument, adaxially with dense indument only at the base and apex; apex entire or bifid 1/8 of length, the lobes not diverging; colleters numerous, in continuous rows or in groups of 2 at the base. Inflorescences spreading, densely hirsute; bracts few, linear-lanceolate, entire, 3–7.5 × 0.8–1.5 mm, densely hirsute underneath, sparsely to densely hirsute above. Flowers odorless; pedicels 1.5–2 mm, with densely appressed trichomes; calyx tubes cup-shaped to shortly tubular, 3.5–4 mm long, densely pilose to hirsute; calyx lobes lanceolate or subulate, not recurved, 5.5–6.5 × 1–1.2 mm, apex acuminate, pilose or hirsute on both sides, occasionally with a single calycophyll; colleters as 1 pair per lobe, in sinuses between calyx lobes; calycophylls ovate to elliptic, 5-nerved, 4–5.5 × 3–4 cm, white, sparsely pubescent along nerves on both surfaces, margins ciliate, apex acute or acuminate, base cuneate; calycophyll stalks 1–1.7 cm, densely pilose;

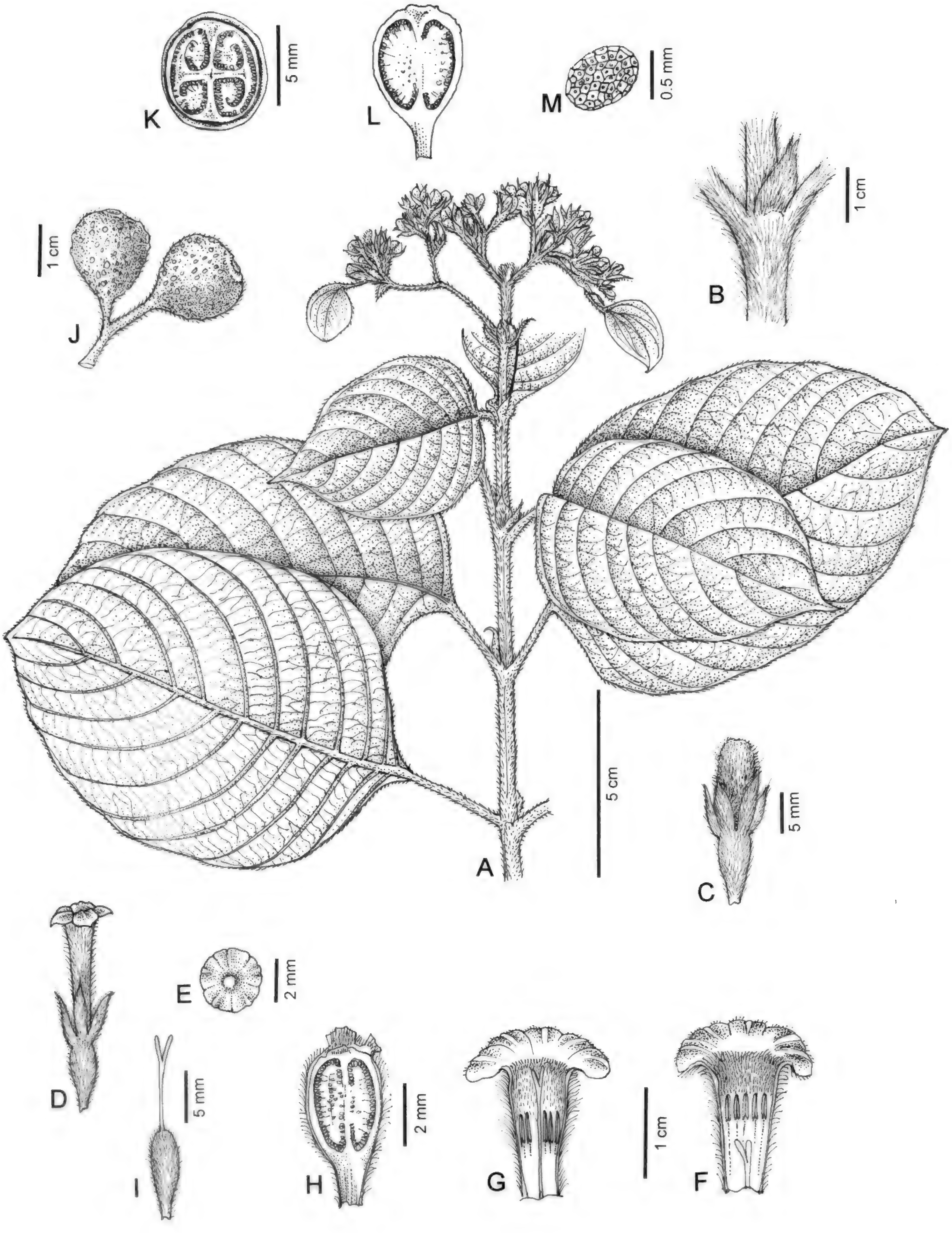

Figure 9. *Mussaenda lanata* C. B. Rob. —A. Flowering branch. —B. Portion of stem with stipule. —C. Flower bud. —D. Open anthesal flower. —E. Corolla lobes in top view. —F. Short-styled flower morph, corolla tube dissected open in longitudinal section. —G. Long-styled flower morph, corolla tube dissected open in longitudinal section. —H. Longitudinal section through ovary. —I. Calyx, style, and stigma of long-styled flower morph, with the corolla and calyx lobes removed. —J. Two fruits. —K, L. Fruit sections showing seed attachments on placentas, with cross and longitudinal sections, respectively. —M. Seed. A–C are taken from *Williams 1011* (NY); D–E, G–I, from *Santos 5678* (L); F, from *Mabesa 35292* (PNH); J–M, from *Alejandro 101* (UBT).

corolla buds densely pilose, remaining pilose all over or becoming pilose only on the upper half and with few scattered trichomes below in open flowers; corolla tubes infundibular, swollen portion around anthers indistinct, 1.1–1.5 cm long, yellowish white, without tuft of trichomes surrounding the opening; short-styled flower morphs with sparsely to densely long, unstriated, ribbon-like trichomes internally to the base of anthers or to the short filaments from the top; long-styled flower morphs with sparsely short, striated, ribbon-like trichomes internally to the base of anthers from the top; corolla lobes somewhat truncate and broader than long, 1.2–1.5 × 2.2–3 mm, yellow, abaxially pilose, adaxially papillate; apex not recurved, with or without 1-mm-long filiform apical appendages; stamens inserted to distal 1/4 in short-styled flower mophs, around middle in long-styled flower morphs, filaments glabrous, anthers linear or linear to narrowly lanceolate, 3.5–4.5 mm in short-styled flower morphs, 3–4 mm in long-styled flower morphs, glabrous, apex acute; pollen diameters to 15.75 µm, apertures 4; ovary 3.5–4.5 × 1.5–2 mm, style 1.6 mm in short-styled flower morphs, 5–7 mm in long-styled flower morphs, stigma 1.8 mm in short-styled flower morphs, 3–5 mm in long-styled flower morphs, smooth, not recurved and included in long-styled flower morphs. Fruits ovoid to ellipsoid, 1.2–1.7 × 0.6–0.8 cm, with dense warts, without vertical ridges green; calyces deciduous, glabrous or sparsely pubescent; mesocarp 0.4–0.6 mm thick; fruiting pedicels 2–4 mm, sparsely pubescent; seeds 0.43–0.56 × 0.36–0.43 mm; exotesta cells with 3 to 6 pores on the inner tangential walls, tuberculate thickenings slightly prominent or inconspicuous.

Local names. Bodos (Bon); Bodas (Igt), according to Alejandro (pers. obs.).

Phenology. *Mussaenda lanata* has been observed to flower from January to May and October to December. Fruiting occurs in May and October to December.

Distribution and habitat. *Mussaenda lanata* is restricted to the Luzon Region, where it is known from the provinces of Abra, Apayao, Benguet, Ilocos Sur, and Mountain. It has been collected from low- to mid-altitude secondary forests, on streamsides, on clay-loamy soils, and from altitudes ranging from 350 to 1200 m.s.m.

Discussion. Merrill mentioned only one collection, *Merrill 6681*, in his 1911 protologue. As a Bureau of Science collection for the flora of the Philippines, one duplicate would have been deposited at PNH and destroyed during World War II. The surviving duplicate at US was identified as "Type" in Jayaweera's treatment of Philippine *Mussaenda* (1964: 116) and "US–lectotype" (1964: 117). No other duplicates have been found.

Mussaenda lanata can be easily distinguished by its very short, infundibular corolla tubes to 1.5 mm, which are usually covered by the calyx lobes before anthesis. This species is also remarkable by its ovate to obovate or orbicular leaves, long stipules to 18.5 mm, and broader than long, truncate corolla lobes. Three *Mussaenda* species, *M. anisophylla*, *M. villosa* Wall., and *M. magallanensis*, were earlier suggested as close allies of *M. lanata* (Robinson, 1911; Jayaweera, 1964), probably by vegetative morphology and indumenta. However, it seems that *M. lanata* is more closely related to *M. chlorantha* and *M. vidalli* based on the inflorescence and flower morphology in that these three generally have densely pubescent inflorescences; few, long, and narrow bracts; short flower pedicels to 1.5–2 mm; and infundibular, pubescent corolla tubes. These three *Mussaenda* species differ in the shape of leaf blades, size of corolla tubes, and morphology of corolla lobes. Moreover, they are all found in Luzon, but *M. chlorantha* extends to Negros Oriental (Visayas), while *M. vidalli* is diverse in the provinces of Visayas and Mindanao.

Additional specimens examined. PHILIPPINES. **Abra:** 17°38′N, 120°52′E, *Ramos 7254* (NY). **Apayao:** Luzon Region/Island, Calanasan, Tanglagan, Mt. Duraragan, 18°14′N, 121°02′E, *Alejandro 101* (UBT, *Univ. Santo Tomas Hb.*). **Benguet:** Kapungun to Sagpat, 17°35′N, 120°23′E, *Clemens 17249* (NY), *Loher A. 1524* (US), *Merill 1768* (A, MO, NY); Sablan, 16°21′N, 120°40′E, *Elmer 6195* (NY), *Williams 1011* (A, NY), *1588* (NY); Baguio, Kennon, Camp 3, 16°24′N, 120°38′E, *Mabesa 35292* (PNH); Baguio, 16°29′N, 120°35′E, *Elmer 8976* (NY, US). **Ilocos Sur:** Tirad Pass, Sitio Sisim, Barrio Mabatano, Mt. Tirad Concepcion, 17°08′N, 120°38′E, *Santos 5678* (L); Lepanto, Cervantes trail, 16°59′N, 120°44′E, *Ramos & Edaño 38103* (A). **Mountain:** Bontoc, 17°05′N, 120°58′E, *Ramos & Edaño 38134* (A).

10. Mussaenda liedeae Alejandro, sp. nov. TYPE: Philippines. Palawan: Palawan Island, Taytay, Ibangley, 10°49′N, 119°30′E, 20 Nov. 2002, *G. J. D. Alejandro 89* (holotype, UBT!; isotypes, NY [barcode] 00888328!, *Univ. Santo Tomas Hb.*!, US!). Figure 10.

Haec species ab aliis speciebus generis foliis ovatis usque ellipticis vel obovatis usque ad 28.5 × 10.5 cm utrinque sparsim hirsutis, venis secundariis adaxialiter prominulis, inflorescentiis multifloris late patentibus, tubo calycis longo et fructibus dense verrucosis distinguenda.

Shrubs 2–4 m tall; young twigs greenish brown, sparsely hirsute, the trichomes more than 12-celled, white to brownish; older branches lenticellate, grayish to reddish brown, glabrous or with few scattered trichomes. Leaf blades ovate to elliptic or sometimes obovate, 6.4–28.5 × 4.1–10.5 cm, membranaceous, sparsely hirsute

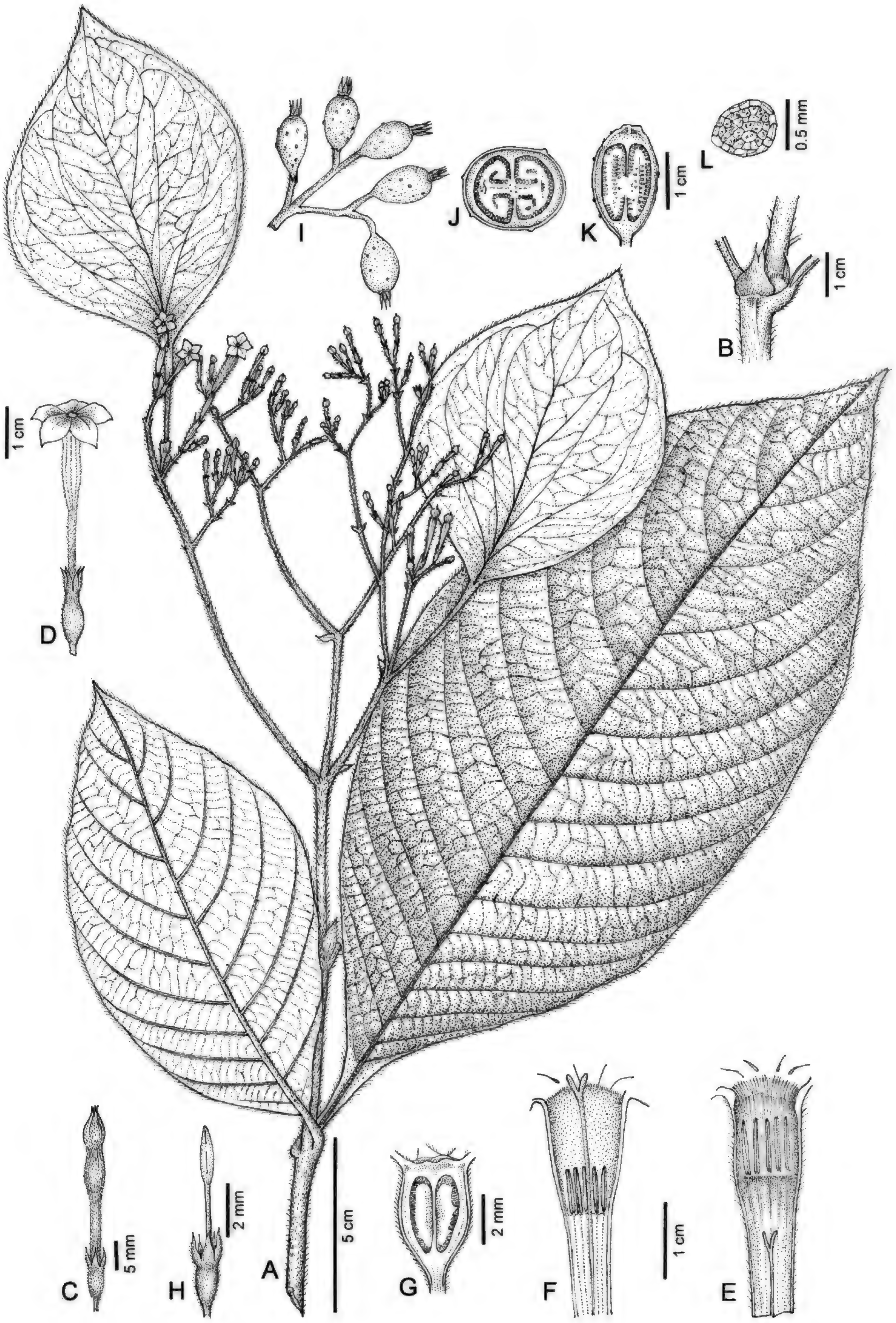

Figure 10. *Mussaenda liedeae* Alejandro. —A. Flowering branch. —B. Portion of stem with stipule. —C. Flower bud. —D. Open anthesal flower. —E. Short-styled flower morph, corolla tube dissected open in longitudinal section. —F. Long-styled flower morph, corolla tube dissected open in longitudinal section. —G. Longitudinal section through ovary. —H. Calyx, style, and stigma of short-styled flower morph, with the corolla removed. —I. Five fruits typically with dense warts. —J, K. Fruit sections showing seed attachments on placentas, in cross and longitudinal sections, respectively. —L. Seed. A–E, G–H are taken from the holotype *Alejandro 89* (UBT); F, I–L, from the paratype *Alejandro 88* (L).

on both sides, especially along midrib and veins, margins ciliate, apex acuminate to subcaudate, not conduplicate, base cuneate to long attenuate; secondary veins in 8 to 16 pairs, prominulous above; petioles 0.3–2 cm, hirsute; stipules triangular, 8.5–11.5 × 3.5–7 mm at the base, deciduous, abaxially hirsute, adaxially hirsute only at the base; apex bifid 1/4 to ± half of length, the lobes slightly diverging; colleters numerous, in continuous rows, or in groups of 2 at the base. Inflorescences widely spreading, sparsely hirsute to glabrate; bracts few, linear to narrowly lanceolate, entire or trilobed, 3.5–7 × 1–2 mm, pubescent underneath, glabrous above; flower pedicels 1–2 mm, with sparse appressed trichomes. Flowers crowded, odorless; flower buds densely pubescent; calyx tubes cup-shaped to tubular, 5–6 mm, pubescent; calyx lobes subulate, not recurved, 2–4 × 1–1.5 mm, pubescent outside, glabrous inside, occasionally with a single calycophyll; colleters as 1 to 3 pairs per lobe, in sinuses between calyx lobes; calycophylls ovate to orbicular, 5-nerved, (4.5–)9–10.5 × (3.8–)7–8.2 cm, white or cream, glabrous or sparsely pubescent along nerves on both surfaces, margins ciliate or glabrous, apex acuminate, base cuneate to obtuse, calycophyll stalks 2–2.5 cm, pubescent; corolla buds densely pubescent, becoming pubescent only on upper half and with few scattered trichomes below in open flowers, corolla tubes cylindrical, forming a distinctly swollen part around anthers, 2.5–3 cm, cream or yellowish white, with or without tuft of trichomes surrounding the opening; short-styled flower morphs with dense, long, unstriate, ribbon-like trichomes internally to the base of anthers from the top; long-styled flower morphs with sparse globular, striate trichomes internally to base of anthers or to the short filaments from the top; corolla lobes ovate, 4–7 × 3–4 mm, golden-yellow or yellow-orange, abaxially sparsely pubescent, adaxially papillate, apex recurved, with 1–2 mm filiform apical appendages; stamens inserted to distal 1/4 in short-styled flower morphs, inserted to the middle in long-styled flower morphs, filaments glabrous, anthers linear, 5–6 mm in short-styled flower morphs, 4.5–5.5 mm in long-styled flower morphs, glabrous, apex acute; pollen diameter to 10.8 μm, apertures 4; ovary 4–5 × 2–2.5 mm; style 2–3 mm in short-styled flower morphs, 20–25 mm in long-styled flower morphs; stigma 1.5–2 mm in short-styled flower morphs, 6–9 mm in long-styled flower morphs, papillose, not recurved and semi-exserted in long-styled flower morphs. Fruits ovoid, 1.5–1.8 × 1–1.1 cm, with warts, without vertical ridges, green, calyces ± persistent or deciduous, glabrous or puberulous; mesocarp 0.6–1 mm thick; fruiting pedicels 2–4 mm, glabrous or puberulous; seeds 0.58–0.9 × 0.48–0.8 mm; exotesta cells with 2 to 6 pores on the inner tangential walls, tuberculate thickenings slightly prominent.

Local names. Buyan (Pal); Boyon (Tbw); Sigidago (Tbw), according to Alejandro (pers. obs.).

Etymology. The epithet of the new species honors Sigrid Liede-Schumann (1957–), who has done much to further the studies of the Apocynaceae–Asclepiadoideae, and who was an advisor who guided the first author in various aspects of taxonomy.

Phenology. *Mussaenda liedeae* has been observed in flower in January, April, October to December, and in fruit November to December.

Distribution and habitat. *Mussaenda liedeae* is endemic to Palawan, found in savanna forests, on slopes near the roadsides, in thickets, on clay or sandy soils, and at altitudes ranging from 30 to 150 m.s.m.

IUCN Red List category. *Mussaenda liedeae* is assessed as Critically Endangered or CR, C2a(i), according to IUCN (2001) criteria. The population size is estimated to number fewer than 2500 mature individuals. A continuing decline in the number of mature individuals is projected, and no subpopulation is estimated to contain more than 250 mature individuals. The habitat of this species is threatened by human land use.

Discussion. This species was first collected in 1984 (*Ridsdale 1542*), and the only flowering specimen in L was initially labeled as *Mussaenda* cf. *setosa*. Similarities between *M. liedeae* and *M. setosa* include the hirsute indumentum in young twigs and inflorescence axes, the larger size of leaf blades, to 28.5 cm and 29.8 cm, respectively, the shape and size of corolla lobes, ovate and to 7 mm and 6 mm, respectively, and the presence of globular trichomes inside corolla tubes of long-styled flower morphs. Recent collections of *M. liedeae* at the same locality as *Ridsdale 1542*, near the Taytay municipality, showed its distinctness from *M. setosa*, which is also found in Palawan. *Mussaenda liedeae* is characterized by ovate or obovate leaves that are only sparsely hirsute, flowers spreading with pedicels to 2 mm, and by longer calyx tubes to 6 mm with smaller lobes to 4 mm. In contrast, *M. setosa* has elliptic to ovate leaves of similar size that are setose, flowers congested with pedicels to 1 mm, and shorter calyx tubes to 3.5 mm with longer lobes to 6 mm.

Paratypes. PHILIPPINES. **Palawan:** Roxas, Sandoval, 10°19′N, 119°21′E, 18 Nov. 2002, *G. J. D. Alejandro 88* (L); Taytay municipality, N of Embarcadero, area near Igang, 10°50′N, 119°28′E, 26 Apr. 1984, *C. Ridsdale 1542*

(L); Taytay, Ibangley, 10°49′N, 119°30′E, 20 Nov. 2002, *G. J. D. Alejandro 90* (PNH, UBT, *Univ. Santo Tomas Hb.*).

11. Mussaenda macrophylla Wall. in Roxb, Fl. Ind. 2 [Carey & Wallich ed.]: 228. 1824, non *Mussaenda macrophylla* Schumach. & Vahl., Beskr. Guin. Pl.: 118. 1827, nom. illeg., nec *Mussaenda macrophylla* Kurz, Forest Fl. Burma 2: 57. 1877, nom. illeg. TYPE: Nepal. s. loc., 1821, *Wallich Cat. no. 6255* (lectotype, designated here, K [barcode] K000031997 digital image!).

Shrubs or (sub)scandent shrubs 2–4 m tall; young twigs green to grayish brown, the trichomes grayish or brown. Leaf blades broadly ovate to elliptic or elliptic to lanceolate, 7–26 × 2.5–15 cm, membranaceous, pilose or puberulous above, sparsely pubescent or hirsute, especially on midrib and veins underneath, margins glabrous, apex acute to acuminate, not conduplicate, base cuneate; secondary veins in 7 to 13 pairs, prominulous above; petioles 0.5–4.2 cm, glabrous, villous or hirsute; stipules ovate or triangular, 5–13.5 × 3.5–9 mm at the base, deciduous, pubescent outside, glabrous or pubescent inside; apex bifid 1/4 to 3/4 of length, the stipule lobes diverging or not; colleters in continuous rows or in groups of 2 at the base. Inflorescences spreading or congested, pubescent or densely hirsute; bracts few, lanceolate or ovate, entire or trilobed, pubescent on both sides; flower pedicels 0.5–1.5 mm, with densely appressed trichomes. Flowers odorless; calyx tubes cup-shaped to shortly tubular, 3–5 mm, densely hirsute; calyx lobes oblong to lanceolate, not recurved, 3.2–14 × 1.2–4 mm, pubescent outside, glabrous or hirsute inside, occasionally with a single calycophyll or all lobes developed as calycophylls; colleters as 1 to 5 pairs per lobe, in sinuses between calyx lobes; calycophylls ovate or elliptic to lanceolate, 5-nerved, 2–9 × 0.5–7 cm, white, glabrous or puberulous along nerves on both surfaces, margins glabrous, apex acute or acuminate, base cuneate or attenuate; calycophyll stalks 0–2.5 cm, puberulous, setose or hirsute; corolla buds densely hirsute, remaining hirsute all over or only on the upper half and with few scattered trichomes below in open flowers; corolla tubes cylindrical, forming a distinctly swollen part around anthers, 2–3.2 cm, with or without tuft of trichomes surrounding the opening; short-styled flower morphs with long, unstriated, ribbon-like trichomes internally to the base of anthers from the top; long-styled flower morphs with sparse striate, ribbon-like trichomes internally to short filaments from the top; corolla lobes elliptic to broadly ovate or orbicular 3.5–5 × 4–6.5 mm, yellow, abaxially pubescent or sparsely hirsute, adaxially papillate, apex not recurved, with or without filiform apical appendages; stamens inserted to distal 1/4 in short-styled flower morphs, around middle in long-styled flower morphs, filaments glabrous; anthers linear, 5–5.7 mm in short-styled flower morphs, 5 mm in long-styled flower morphs, glabrous, apex acute; ovary 3.5–5.5 × 2–2.5 mm, style 3.5–14 mm in short-styled flower morphs, 16–23 mm in long-styled flower morphs, stigma 2.5–4 mm in short-styled flower morphs, 2.5–7.5 mm in long-styled flower morphs, smooth, not recurved and included in long-styled flower morphs. Fruits oblong-ovoid, 1–1.2 cm, with sparse to dense warts, without vertical ridges, green or dark purple; calyces deciduous, sparsely pubescent; seeds 0.67–1.03 × 0.48–0.73 mm, exotesta cells with 2 to 6 pores on the inner tangential walls, tuberculate thickenings slightly prominent.

Discussion. In the protologue of his new species, Wallich designated no type specimen but mentioned two Nepalese localities, "mountains of Chundra-giria and Nagarjoon," showing that his description (Roxburgh, 1824: 228) is based on at least two different gatherings. In Wallich's Catalogue (Wallich 1832 [1828–1849]) only a single entry for *Mussaenda macrophylla* is found under the number 6255, including the data "Napalea 1821." All Wallich specimens that have been traced bear this number and are regarded as syntypes. One specimen, K000031997, bears the number 6295, additionally added in pencil by a different hand. However, the number 6295 in Wallich's Catalogue referred to another species (*Hopea wightiana* Wall.), so that this addition was obviously a typographic error. The Kew sheet (barcode, K000031997) is regarded as belonging to the original set of Wallich specimens and is here chosen to serve as lectotype. All other syntypes may belong to different gatherings, and it seems advisable to restrict the type to a single lectotype.

Additional specimens examined. INDIA. Nepal (s. loc.), 1821 (syntypes, GH [bc] 00096260 digital image!, E [bc] 00438211 digital image!, E [bc] 00438212 digital image!, K [bc] K001123448 digital image!, K [bc] K001123449 digital image, NY [bc] 00132295!).

KEY TO THE VARIETIES OF *MUSSAENDA MACROPHYLLA*

1a. Shrubs or scandent shrubs; leaf blades puberulous adaxially, petioles more than 1 cm long; calyx lobes occasionally with a single calycophyll.
  2a. Stipules 7–12 mm long; calyx lobes 3.2–8 × 2–2.5 mm; corolla 2.3–2.6 mm long, without tuft of trichomes in the opening; plants from the Philippines .... 11a. *M. macrophylla* Wall. var. *brevipilosa* Jayaw.
  2b. Stipules 12–13.5 mm long; calyx lobes 8.5–14 × 1.2–4 mm; corolla 2.4–3.2 mm long,

with tuft of trichomes in the opening; plants from southern Asia (excluding the Philippines) .... 11c. *M. macrophylla* Wall. var. *macrophylla*

1b. Erect shrubs; leaf blades pilose adaxially, petioles 1 cm or less; calyx lobes all developed into calycophylls; plants from India .... 11b. *M. macrophylla* Wall. var. *grandisepala* (Jayaw.) Alejandro

11a. Mussaenda macrophylla Wall. var. **brevipilosa** Jayaw., J. Arnold Arbor. 45: 117. 1964. TYPE: Philippines. Batanes: Batanes Island, May–June 1907, *E. Fenix 3770* (holotype, NY [barcode] 00689069!; isotype, US!). Figure 11.

Shrubs or scandent shrubs 3–4 m tall; young twigs sparsely hirsute, the trichomes more than 12-celled, brown; older branches with few to many lenticels, reddish brown, glabrous. Leaf blades 10–26 × 5–15 cm, puberulous above, sparsely pubescent underneath; secondary veins in 8 to 13 pairs; petioles 0.6–4.2 cm long, glabrous or sparsely hirsute; stipules triangular, 7–12 × 3.5–7 mm at the base, with sparse indument on both sides; apex bifid, the stipule lobes not diverging; colleters numerous. Inflorescences densely hirsute; bracts 5–7 × 1–2.5 mm, sparsely pubescent underneath, glabrous or puberulous above; flower pedicels 1–1.5 mm. Flowers with calyx tubes 3–3.5 mm; calyx lobes 3.2–8 × 2–2.5 mm, hirsute on both surfaces, occasionally with a single calycophyll; calycophylls ovate, 6.5–9 × 3.3–7 cm, base cuneate; calycophyll stalks 1.7–2.5 cm, puberulous; corolla tubes 2.3–2.6 cm long, without tuft of trichomes surrounding the opening; long-styled flower morphs with sparsely short trichomes inside; corolla lobes ovate to elliptic, 5 × 4–5 mm, without filiform apical appendages, abaxially sparsely hirsute; anthers 5–5.5 mm in short-styled flower morphs, 5 mm in long-styled flower morphs; pollen diameters to 15.3 μm, apertures 4; ovary 4–5.5 mm, style 3.5–4 mm in short-styled flower morphs, 18–19 mm in long-styled flower morphs, stigma 2.5–3 mm in short-styled flower morphs, 7–7.5 mm in long-styled flower morphs. Fruits globose to ellipsoid, green; mesocarp 0.3–0.5 mm thick; fruiting pedicels 3–4 mm; seeds 0.67–0.87 × 0.48–0.72 mm.

Local name. Kamaligi (Ivt), according to Alejandro (pers. obs.).

Phenology. This variety has been observed to flower from May to June, but the time of fruiting is not known.

Distribution and habitat. *Mussaenda macrophylla* var. *brevipilosa* is found in the Philippines, on Batanes and Calayan Islands, from the provinces of Batanes and Cagayan, respectively, as well as from Rizal Province. The variety has been collected from low-altitude forests, on edges of forests, on riversides, on clay or sandy soils, and from altitudes ranging from 150 to 300 m.s.m.

Discussion. *Mussaenda macrophylla* var. *brevipilosa* differs from *M. macrophylla* var. *macrophylla*, the autonymic variety found in India, Myanmar, and China, by its smaller stipules, corolla, and calyx lobes. In addition, *M. macrophylla* var. *brevipilosa* has short, straplike trichomes inside the corolla of long-styled flower morphs, whereas in *M. macrophylla* var. *macrophylla* the corolla trichomes are longer in long-styled flower morphs.

Additional specimens examined. PHILIPPINES. **Batanes:** Batan Island, Mt. Iraya, 20°22′N, 121°55′E, *Quisumbing et al. 79364* (PNH), *79931* (PNH); Mt. Matarem, 20°27′N, 121°59′E, *del Rosario 79959* (PNH). **Cagayan:** Calayan Island, San Vicente, 19°21′N, 121°24′E, *Quisumbing & del Rosario 79842* (PNH), *79858* (PNH); Mt. Babatngin, *Edaño 79448* (A). **Rizal:** Mt. Lumutan, 13°97′N, 121°97′E, *Ramos & Edaño 29719* (A).

11b. Mussaenda macrophylla Wall. var. **grandisepala** (Jayaw.) Alejandro, stat. nov. Basionym: *Mussaenda macrophylla* f. *grandisepala* Jayaw., J. Arnold Arbor. 44: 246. 1963. *Mussaenda pentasemia* C. E. C. Fisch., Bull. Misc. Inform. Kew 1928(7): 275. 1928. TYPE: India. Assam: Nhatial, Lushai Hills, July 1927, *N. E. Parry* 275 (lectotype, designated here, K [barcode] K000031998 [sheet V, ft.] digital image!; isolectotypes, K [bc] K000031999 [IV, veg.] digital image!, K [bc] K000032000 [III, ft.] digital image!, K [bc] K000032001 [II, fr.] digital image!, K [bc] K000032002 [I, ft.], digital image!).

Shrubs 2–3 m tall; young twigs densely villous. Leaf blades 7–12 × 2.5–6 cm, sparsely pilose on both sides; secondary veins in 7 to 9 pairs; petioles 0.5–1 cm, densely villous; stipules broadly ovate, 5–10 × 5 mm at the base, with indument on both sides, apex bifid, the stipule lobes not diverging, colleters numerous. Inflorescences pubescent; bracts densely pubescent on both sides. Flowers subsessile; calyx tubes 3.5–4.5 mm; calyx lobes all developing into calycophylls; calycophylls oblong or elliptic to lanceolate, 2–7 × 0.5–4 cm, base attenuate; calycophyll stalks 0–2.5 cm, setose; corolla tubes 2 cm, with tuft of trichomes surrounding the opening; long-styled flower morphs with sparse short trichomes inside; corolla lobes orbicular to ovate, 3.5 × 4.5 mm, with filiform

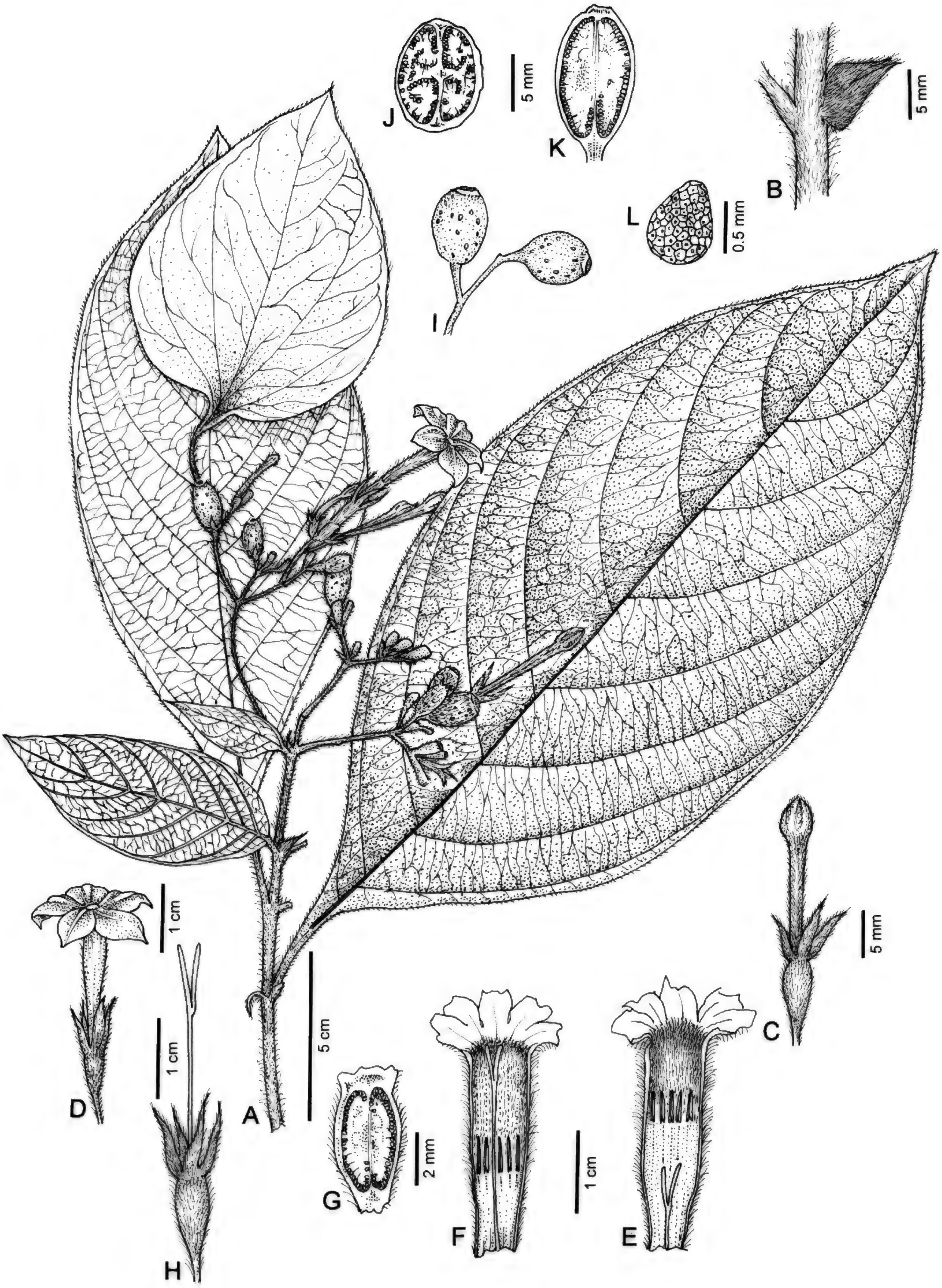

Figure 11. *Mussaenda macrophylla* Wall. var. *brevipilosa* Jayaw. —A. Flowering branch. —B. Portion of stem with stipule. —C. Flower bud. —D. Open anthesal flower. —E. Short-styled flower morph, corolla tube dissected open in longitudinal section. —F. Long-styled flower morph, corolla tube dissected open in longitudinal section. —G. Longitudinal section through ovary. —H. Calyx, style, and stigma of long-styled flower morph, with the corolla removed. —I. Two fruits. —J, K. Fruit sections showing seed attachments on placentas, in cross and longitudinal sections, respectively. —L. Seed. A, B, F, and H are taken from *Quisumbing & del Rosario 79858* (PNH); E, from *Quisumbing & del Rosario 79842* (PNH); C, D, I, and L, from the holotype *Fenix 3770* (NY).

apical appendages, abaxially pubescent; anthers 5.2 mm in short-styled flower morphs, 5 mm in long-styled flower morphs; ovary 4–5 mm. Fruits not seen.

Phenology. *Mussaenda macrophylla* var. *grandisepala* has been collected in flower in July. Fruits were collected in July as noted from the type.

Distribution. *Mussaenda macrophylla* var. *grandisepala* is distributed in Assam, India, and is known from an altitude of 925 m.s.m. The variety does not occur in the Philippines.

Discussion. The name *Mussaenda pentasemia* is homotypic to *M. macrophylla* f. *grandisepala*. Fischer's 1928 protologue was published prior to Jayaweer's 1963 description of the form *grandisepala*. Fischer noted one collection "India. Assam, in the Lushai Hills at Nhatial, 925 m, Mrs. N. E. Parry 275..." The word "typus" or "type" was not used, but this was not required until 1958 (Art. 40.1, McNeill et al., 2012). Fischer's name at species rank has no priority over Jayaweer's epithet at infraspecific rank (Art. 11.2).

Five sheets of *Parry 275* that were numbered sequentially (I, II, III, IV, V) were found at Kew, and there is no distinction of type among the sheets. Labels identifying "Type specimen" are found on sheets I and V, with "for fruits and seeds" further annotated on sheet I. A lectotype is designated among these five duplicates, from sheet V, which has abundant fertile material.

11c. Mussaenda macrophylla Wall. var. **macrophylla.**

(Sub)scandent shrubs; young twigs densely pubescent, the trichomes grayish brown, becoming brown when dry. Leaf blades 8–20 × 3–10.5 cm, puberulous above, hirsute underneath; secondary veins in 9 to 11 pairs; petioles 1–4 cm, densely hirsute; stipules ovate, 12–13.5 × 6–9.5 mm at the base, densely pubescent outside, glabrous or hairy inside; apex bifid, the stipule lobes diverging; colleters few to numerous. Inflorescences pubescent; bracts pubescent on both surfaces; fertile pedicels 0.5–1 mm; calyx tubes 3.5–5 mm; calyx lobes 8.5–14 × 1.2–4 mm, pubescent outside, glabrous to puberulous inside, occasionally with a single calycophyll; calycophylls ovate or broadly lanceolate, 6–9 × 2.5–6.7 cm, base cuneate; calycophyll stalks 1.7–2.5 cm, hirsute; corolla tubes 2.4–3.2 cm long, with tuft of trichomes surrounding the opening; long-styled flower morphs with sparse but long trichomes inside; lobes broadly ovate or orbicular, 4–5 × 4–6.5 mm, with filiform apical appendages, abaxially pubescent; anthers 5–5.7 mm; ovary 3.5–4.5 mm, style 9–14 mm long in short-styled flower morphs, 16.5–23 mm in long-styled flower morphs, stigma 3.5–4 mm in short-styled flower morphs, 2.5–3.5 mm in long-styled flower morphs. Fruits oblong ovoid, dark purple; fruiting pedicels 3–4 mm; seeds 0.9–1.03 × 0.73 mm.

Phenology. This variety has been collected in flower from May to August and October, and in fruit in June, November to December and January.

Distribution and habitat. *Mussaenda macrophylla* var. *macrophylla* is known from India, Myanmar, and China and is found in low- to mid-altitude forests, ranging from 300 to 1500 m.s.m.

Additional specimens examined. CHINA. **Taiwan:** Botel Tobago, *C. E. Chang 2754* (L). INDIA. Middle Andamans, Nimbutala, near Rangat, *N. Bhargava 1757* (L).

12. Mussaenda magallanensis Elmer, Leafl. Philipp. Bot. 3: 996–997. 1911. TYPE: Philippines. Romblon: Sibuyan Island, Magallanes, Mt. Giting-giting [Mt. Guiting-guiting], 12°23′N, 122°35′E, May 1910, *A. D. E. Elmer 12451* (lectotype, designated by Jayaweera [1964: 121], A [barcode] 00096196!; isolectotypes, E [bc] 00502304 digital image!, GH [bc] 00303908 digital image!, K [bc] 000740915 digital image!, L [bc] L000000795!, MICH [bc] 1108211 digital image!, MO [bc] 000716936 digital image!, NY [bc] 00132311!, U [bc] 0227258 digital image!, US [bc] 000137855!). Figure 12.

Shrubs 1.5–3 m tall; young twigs green to yellowish brown, hirsute, the trichomes more than 12-celled, brown; older branches with numerous lenticels, reddish brown, glabrous or with few scattered hairs. Leaf blades ovate to elliptic or orbicular to ovate, 6.5–28.5 × 3.5–15 cm, membranaceous, hirsute above, densely hirsute especially on midrib and veins underneath, margins ciliate, apex abruptly acuminate to subcaudate, not conduplicate, base cuneate; secondary veins in 10 to 13 pairs, prominulous above; petioles 0.6–5 cm, densely hirsute; stipules triangular to ovate, 7–16 × 3–9 mm at the base, deciduous, with dense indument on both sides; apex entire or bifid 1/4 of length, the stipule lobes not diverging; colleters numerous, in groups of 2 at the base. Inflorescences spreading or congested, densely hirsute; bracts few, linear to narrowly lanceolate, entire to trilobed, 4–11 × 1–2.5 mm, densely hirsute underneath,

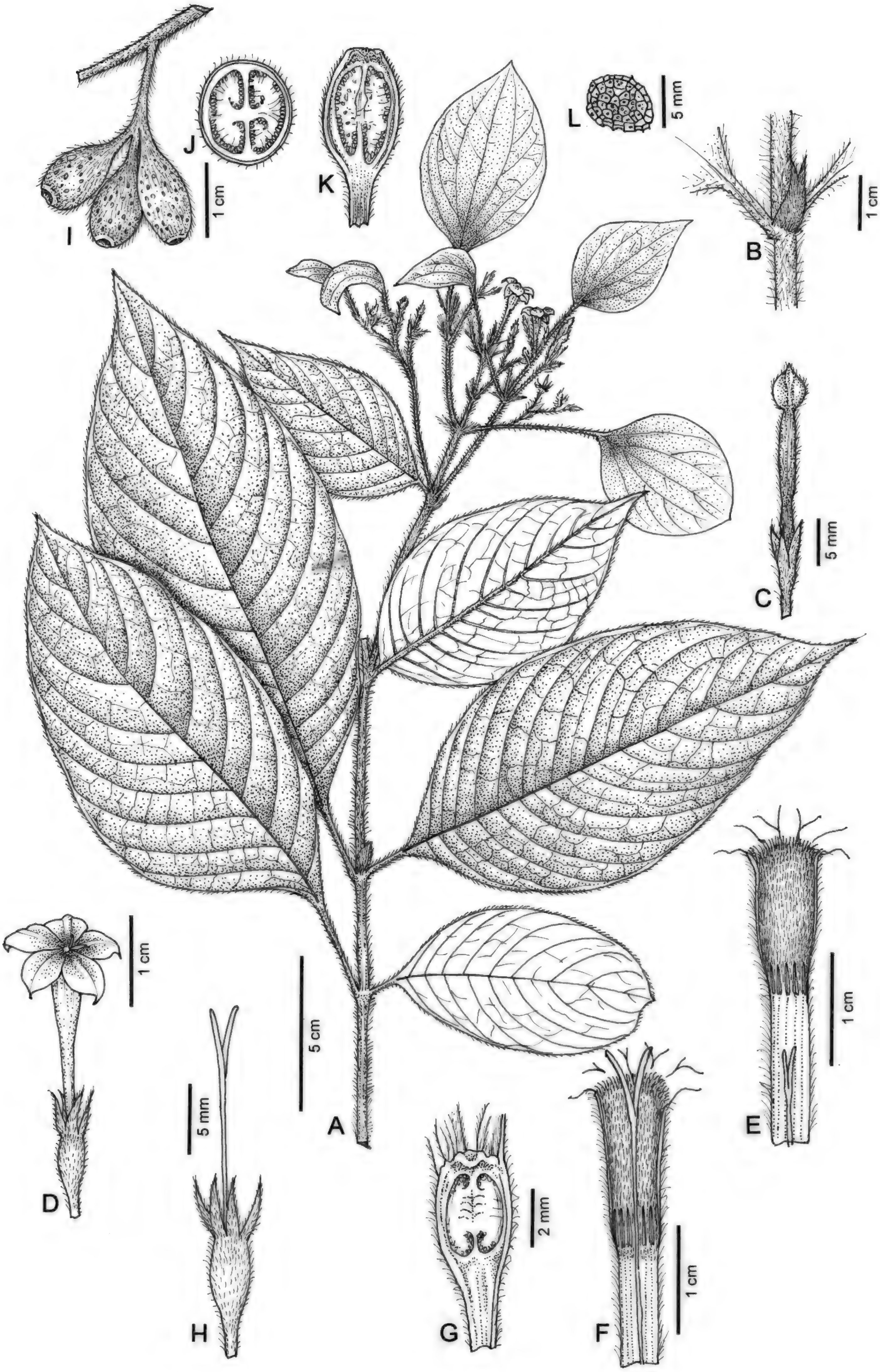

Figure 12. *Mussaenda magallanensis* Elmer. —A. Flowering branch. —B. Portion of stem with stipule. —C. Flower bud. —D. Open anthesal flower. —E. Short-styled flower morph, corolla tube dissected open in longitudinal section. —F. Long-styled flower morph, corolla tube dissected open in longitudinal section. —G. Longitudinal section through ovary. —H. Calyx, style, and stigma of long-styled flower morph, with the corolla removed. —I. Three fruits. —J, K. Fruit sections showing seed attachments on placentas, in cross and longitudinal sections, respectively. —L. Seed. A–E are taken from *Alejandro 5* (NY); F–L, from *Alejandro 3* (UBT).

glabrous or sparsely hirsute above; flower pedicels 2–2.5 mm, with appressed trichomes. Flowers odorless; calyx tubes cup-shaped to shortly tubular, 3–4 mm, hirsute; calyx lobes subulate, not recurved, 4–5 × 0.5–1 mm, hirsute on both surfaces, occasionally with a single calycophyll; colleters as 2 or 3 pairs per lobe, in sinuses between calyx lobes; calycophylls orbicular to elliptic or ovate, 5-nerved, 4–6 × 4–5.5 cm, white, glabrous above, pubescent only along nerves beneath, margins ciliate, apex acute or acuminate, base cuneate; calycophyll stalks 2–2.7 cm, pubescent; corolla buds pubescent, remaining either pubescent or usually glabrate in open flowers; corolla tubes cylindrical, forming a distinctly swollen part around anthers, 2–2.4 cm, yellowish white, with tuft of trichomes surrounding the opening; short-styled flower morphs with dense, long, unstriated, ribbon-like trichomes internally to base of anthers from the top; long-styled flower morphs with sparse short, striate, ribbon-like trichomes internally to short filaments from the top; corolla lobes ovate, 5–6 × 3.5–5 mm, orange to yellow, abaxially pubescent, adaxially papillate; apex not recurved, without filiform apical appendages; stamens inserted to distal 1/4 in short-styled flower morphs, around middle in long-styled flower morphs, filaments glabrous; anthers linear, 4–5 mm in short-styled flower morphs, 3–4 mm in long-styled flower morphs, glabrous, apex acute; pollen diameters to 16.2 μm, apertures 4, rarely 3; ovary 3–3.5 × 2 mm, style 4–5 mm in short-styled flower morphs, 12–14 mm in long-styled flower morphs, stigma 1–1.5 mm in short-styled flower morphs, 10–12 mm in long-styled flower morphs, smooth, recurved and semi-exserted in long-styled flower morphs. Fruits globose or obovoid, 1–1.3 × 0.9–1.1 cm, with sparse to dense warts, without vertical ridges, green, calyces deciduous, sparsely hirsute; mesocarp 0.8–1 mm thick; fruiting pedicels 4–7 mm, sparsely hirsute; seeds 0.5–0.67 × 0.33–0.53 mm, exotesta cells with 4 to 10 pores on the inner tangential walls, tuberculate thickenings slightly prominent.

Local names. Agboy (BisPn); Banay-dagat (Myn); Mabiun-tama, Mabiun-tina (Bng); Potenjsolab (unknown dialect), according to Alejandro (pers. obs.).

Phenology. Mussaenda magallanensis has been observed to flower from January to June, August, and October to December, with fruiting noted from September to November.

Distribution and habitat. Mussaenda magallanensis is known from the provinces of Mindoro, Laguna, and Pampanga in the Luzon Region, from the provinces of Romblon (western Visayas) and Leyte (eastern Visayas), and from the province of Isabella on Basilan Island to the south. It has been collected from low- and mid-altitude forests, on mountainsides, on riversides, on brushlands, on clay-loamy or sandy soils, and at altitudes of 10–500 m.s.m.

Discussion. Elmer (1911a: 997) cited his "Type specimen number" as 12451, and Jayaweera (1964: 121) would later specify "A–lectotype; GH, NY, US–isotypes." Additional isolectotypes (E, K, L, MICH, MO, and U) have been found, although Elmer's type at PNH was destroyed during World War II.

Mussaenda magallanensis is similar to *M. anisophylla* in the hirsute indumentum of vegetative parts and inflorescences, in the generally ovate to elliptic shape of the leaves, in the size of the stipules (to 16 mm in *M. magallanensis*, to 15 mm in *M. anisophylla*), in the breadth and shape of the calycophylls (to 5.5 cm wide, orbicular to elliptic or ovate vs. to 6 cm wide, elliptic to ovate in *M. anisophylla*), and in the shape and length of the corolla lobes (ovate, to 6 cm long vs. broadly ovate, to 6 cm long in *M. anisophylla*). However, *M. magallanensis* differs from *M. anisophylla* by its dense pubescence in the corolla (vs. typically hirsute in *M. anisophylla*), by fewer bracts and shorter calyx lobes to 6 mm that are hirsute on both sides (vs. to 15 mm and hirsute externally in *M. anisophylla*), by the presence of trichomes at the mouth of the corolla, by the longer stigmata to 14 mm that are recurved and semi-exserted in long-styled flower morphs (vs. to 9 mm in *M. anisophylla*), by the smaller fruits to 1.3 × 1.1 cm (vs. to 2 × 1.2 cm in *M. anisophylla*), and by more pores (four to 10) on the inner tangential walls of the seed exotesta (two to six in *M. anisophylla*).

Additional specimens examined. PHILIPPINES. **Capiz:** Panay Island, 11°17′N, 122°18′E, *Edaño 46114* (NY); Antique Prov., locality not indicated, *McGregor 32499* (A). **Isabela:** San Mariano, 16°59′N, 122°00′E, *Ramos & Edaño 46977* (NY). **Laguna:** Luzon, Mt. Banahaw, 14°04′N, 121°29′E, *Ocampo 27899* (US); Majayjay, 14°09′N, 121°08′E, *Rivera & Duyag 75002* (BR); Balayhangin, Calawang, 13°55′N, 120°52′E, *Sulit 18877* (PNH); Los Baños, Inst. Pl. Breeding (IPB), 14°10′N, 121°11′E, *Alejandro 5* (BR, NY), Forestry Nursery, *Sulit 3442* (PNH). **Leyte:** Leyte Island, *Wenzel 442* (A, MO, US). **Mindoro Oriental:** Mindoro Island, Calapan, 13°24′N, 121°10′, *Merrill 985* (NY), *986* (A, MO, NY); Pinamalayan, 13°02′N, 121°29′E, *Maliwanag 113* (PNH), *Ramos 40955* (US); N slope of Mt. Alinyaban, 5 km SW of Puerto Galera, 13°28′N, 120°55′E, *Burley 147* (L); Baco River, 13°20′N, 121°05′E, *McGregor 131* (NY, US), *Merrill 4072* (NY, US);

Sablayan, Ligaya, 12°50′N, 120°47′E, *Reed 40896* (PNH), *40902* (PNH); Puerto Galera, 13°28′N, 120°55′E, *Britton 120* (PNH), *Ramos 46385* (NY), *Santos 5212* (L). **Pampanga:** Clark, Fontana, 15°09′N, 120°32′E, *Alejandro 3* (L, UBT, *Univ. Santo Tomas Hb.*, WAG).

13. Mussaenda milleri Elmer ex Alejandro, sp. nov. *Mussaenda milleri* Elmer, Leafl. Philipp. Bot. 10: 3780. 1939, nom. inval. TYPE: Philippines. Nueva Ecija: Luzon, Mt. Umingan, Aug.–Sep. 1916, *Bureau of Sci. No. 26468* [*M. Ramos with G. Edaño*] (holotype, NY [barcode] 00132312!; isotype, US [bc] 001375472!).

Haec species ab aliis speciebus generis partibus vegetativis et inflorescentiis trichomatibus rubrobrunneis hirsutis, foliis parvis, venis lateralibus paucis (5 ad 11 paribus) et lobis corollae rubeoaurantiacis adaxialiter papillatis abaxialiter hirsutis differt.

Shrubs 3 m tall or more; young twigs green, sparsely to densely hirsute, the trichomes more than 12-celled, reddish brown; older branches with few lenticels, grayish brown, glabrous. Leaf blades elliptic to ovate, 7–12 × 3–6 cm, membranaceous, sparsely hirsute on both sides, especially on midrib and veins underneath, margins ciliate, apex acute to acuminate or subcaudate, recurved, not conduplicate, base obtuse to cuneate; midribs slightly sunken above; secondary veins in 5 to 11 pairs, prominulous above; petioles 1–2 cm, densely hirsute; stipules triangular to broadly lanceolate, 7–12 × 4–6 mm at the base, deciduous, with dense indument on both sides; apex bifid ± half of length, the stipule lobes not diverging; colleters numerous, in groups of 2 at the base. Inflorescences spreading, densely hirsute; bracts few, linear to narrowly lanceolate, entire, 2.5–4 × 1–1.5 mm, densely hirsute on both sides; flower pedicels with sparsely to densely appressed trichomes. Flowers odorless; calyx lobes not recurved, 3–5 mm, hirsute on both surfaces, occasionally with a single calycophyll; calycophylls elliptic, 5-nerved, 7.2 × 3.5 cm, yellowish white, sparsely pubescent along nerves of both surfaces, margins ciliate, apex acute to acuminate, base attenuate; calycophyll stalks 2.3 cm, densely pubescent; corolla buds hirsute, becoming hirsute only in upper half and with few scattered trichomes below in open flowers; corolla tubes cylindrical, forming a distinctly swollen portion around anthers, 2–3 cm long; corolla lobes elliptic, red-orange abaxially sparsely hirsute, adaxially papillate. Fruits ellipsoid to obovoid, 1–1.5 × 0.8–0.9 cm, with sparse to dense warts, without vertical ridges, calyces deciduous, hirsute; mesocarp 0.3–0.6 mm thick; fruiting pedicels 2–4 mm, densely hirsute; seeds 0.6–0.7 × 0.67–0.8 mm; exotesta cells with 2 to 5 pores on the inner tangential walls, tuberculate thickenings slightly prominent.

Phenology. *Mussaenda milleri* has been observed to flower in March, with fruiting August to September.

Distribution and habitat. *Mussaenda milleri* is endemic to the province of Nueva Ecija, Luzon, in the Philippines. It has been collected from mid-altitude disturbed forest at an altitude of 1065 m.s.m. *Mussaenda milleri* is one of the few Philippine species found at high altitudes above 1000 m.s.m. and appears to be rare.

IUCN Red List category. *Mussaenda milleri* is assessed as Critically Endangered or CR D, with a very small population size estimated to number fewer than 50 mature individuals. *Mussaenda milleri* is considered the most threatened and rare among Philippine *Mussaenda* species due to its restricted population on Mount Umingan (Nueva Ecija). A continuing decline is projected in the area of occupancy and quality of habitat as logging activities by local indigents is evident.

Discussion. *Mussaenda milleri* is a poorly known species known only from the type represented by fruiting material. It is easily recognized by its reddish brown trichomes on the vegetative parts and inflorescences, by the small elliptic to ovate leaves to 12 cm with few lateral vein pairs (five to 11), and by the orange-red, abaxially hirsute corolla lobes. The holotype (*Elmer 22694*, Camp Labi, "summit mountain ridge," Elmer, 1939: 3780) was destroyed at PNH during World War II. Jayaweera (1964: 122) did cite NY and US duplicates for *Ramos & Edaño 26468* as "nearest to the original description," which was also collected from the vicinity of Camp Labi, and Jayaweera's taxonomic opinion is followed here. He characterized *M. milleri* as closely similar to *M. nervosa*, primarily due to the abaxially sunken midrib of leaf blades and the deciduous calyces on fruits. However, the two species have divergent types of indumentum in both vegetative and reproductive parts, number of secondary veins, color and shape of corolla lobes, size of seeds, and number of pores on the inner tangential walls of exotesta. *Mussaenda milleri* is characterized by hirsute indumentum, five to 11 pairs of secondary veins, red-orange and elliptic corolla lobes, slightly larger seeds to 0.7 × 0.8 mm, and two to five pores in seed exotesta on the inner tangential walls. On the other hand, *M. nervosa* has pilose indumentum, 10 to 15 pairs of secondary veins, yellow and ovate corolla lobes, smaller seeds to 0.6 × 0.4 mm, and four to 12 pores in seed exostesta.

There are only two sheets, both fruiting, of the type collection *Ramos & Edaño 26468* known from NY and US that were available for examination, and the NY sheet is designated as the holotype. Elmer did not provide a Latin diagnosis and the name was invalidly published in 1939, since a Latin diagnosis or description was required after 1 January 1935 (McNeill et al., 2012, Art. 39.1). Further, Elmer's PNH type (*Elmer 22694* from Luzon, collected in March 1937) was destroyed during World War II, and duplicates were evidently not distributed to other herbaria. Elmer's species name is validated herein based on an earlier collection (1916) from approximately the type locality in Luzon. The morphological description of the flower is taken from his description of the destroyed type, which was flowering; however, no flowering material was available to the authors.

14. **Mussaenda multibracteata** Merr., Philipp. J. Sci., 11(Pt. C): 34. 1916. TYPE: Philippines. Sorsogon: Luzon [Bicol region], Mt. Pocdal, 12°58′N, 124°01′E, July–Aug. 1915, *M. Ramos 23585* (lectotype, designated by Jayaweera [1964: 124], NY [barcode] 00132313!; isolectotypes, A [bc] 00096197 digital image!, K [bc] K000740978 digital image!, US [bc] 000137856 digital image!). Figure 13.

Shrubs or trees, 2–6 m tall; young twigs greenish brown, densely hirsute, the trichomes more than 12-celled, brown; older branches with few to many lenticels, reddish brown, glabrous or with few scattered trichomes. Leaf blades lanceolate to elliptic, or elliptic to ovate, 9.5–30 × 4–16 cm, membranaceous to subcoriaceous, sparsely to densely hirsute above, densely hirsute, especially on midrib and veins underneath; margins ciliate; apex acuminate, not conduplicate; base cuneate or long attenuate; secondary veins in 8 to 11 pairs, prominulous above; petioles 1–3 cm long, densely hirsute; stipules triangular, 6.5–14 × 5–7 mm at the base, persistent or deciduous, abaxially with dense indument, adaxially with dense indument only at the base; apex bifid ± half to 3/4 of length, the lobes slightly diverging or not; colleters numerous, in continuous rows or in groups of 2 at the base. Inflorescences spreading or congested, densely hirsute; bracts numerous, lanceolate, entire to trilobed, 5–13.5 × 1.5–2.5 mm, densely hirsute underneath, with tuft of trichomes only at the base above; pedicels 0.5–1 mm, with dense, ascending trichomes. Flowers odorless; calyx tubes cup-shaped to shortly tubular, 6–8 mm long, densely hirsute; calyx lobes foliaceous, persistent, not recurved, 20–27 × 6–7 mm, with distinct median ridge, hirsute on both surfaces, occasionally with a single calycophyll; colleters as 1 or 2 pairs per lobe, in sinuses between calyx lobes; calycophylls with blades ovate or elliptic, 5-nerved, 5.5–11.7 × 3–6.8 cm, white, sparsely pubescent especially along nerves on both surfaces, margins ciliate, apex acute or acuminate, base cuneate to attenuate; calycophyll stalks 2–3.5 cm, densely hirsute; corolla buds densely hirsute, becoming hirsute only in the upper half and with few scattered trichomes below in open flowers; corolla tubes infundibular, swollen portion around anthers indistinct, 2.5–2.8 cm long, yellowish white, without tuft of trichomes surrounding the opening; short-styled flower morphs with dense, long, unstriated, ribbon-like trichomes internally to the base of anthers from the top; long-styled flower morphs with sparse, short, striate, ribbon-like trichomes internally to short filaments from the top; corolla lobes ovate or broadly elliptic, 5–6 × 4–5 mm, yellow to orange, abaxially hirsute, adaxially papillate, apex not recurved without filiform apical appendages; stamens inserted to distal 1/4 in short-styled flower morphs, around middle in long-styled flower morphs, filaments glabrous, anthers linear, 5–5.5 mm in short-styled flower morphs, 6–6.5 mm in long-styled flower morphs, glabrous, apex acute or obtuse; pollen diameters to 14.85 μm, apertures 4, rarely 3; ovary 5–5.5 × 2–2.5 mm, style 3–5 mm in short-styled flower morphs, 18–22 mm in long-styled flower morphs, stigma 1–1.5 mm in short-styled flower morphs, 7–9 mm in long-styled flower morphs, smooth, not recurved and included in long-styled flower morphs. Fruits ellipsoid, 1.7–2.2 × 1–1.2 cm, with dense warts, without vertical ridges, green, calyces persistent, densely hirsute; mesocarp 1–1.2 mm thick; fruiting pedicels 4–6 mm, densely hirsute; seeds 0.53–0.67 × 0.46–0.56 mm; exotesta cells with 4 to 11 pores on the inner tangential walls, tuberculate thickenings slightly prominent.

Local names. Langla (Sbl); Tana-tana (Bik), according to Alejandro (pers. obs.).

Phenology. *Mussaenda multibracteata* has been observed to flower in May to November and in fruit from July to August and October to December.

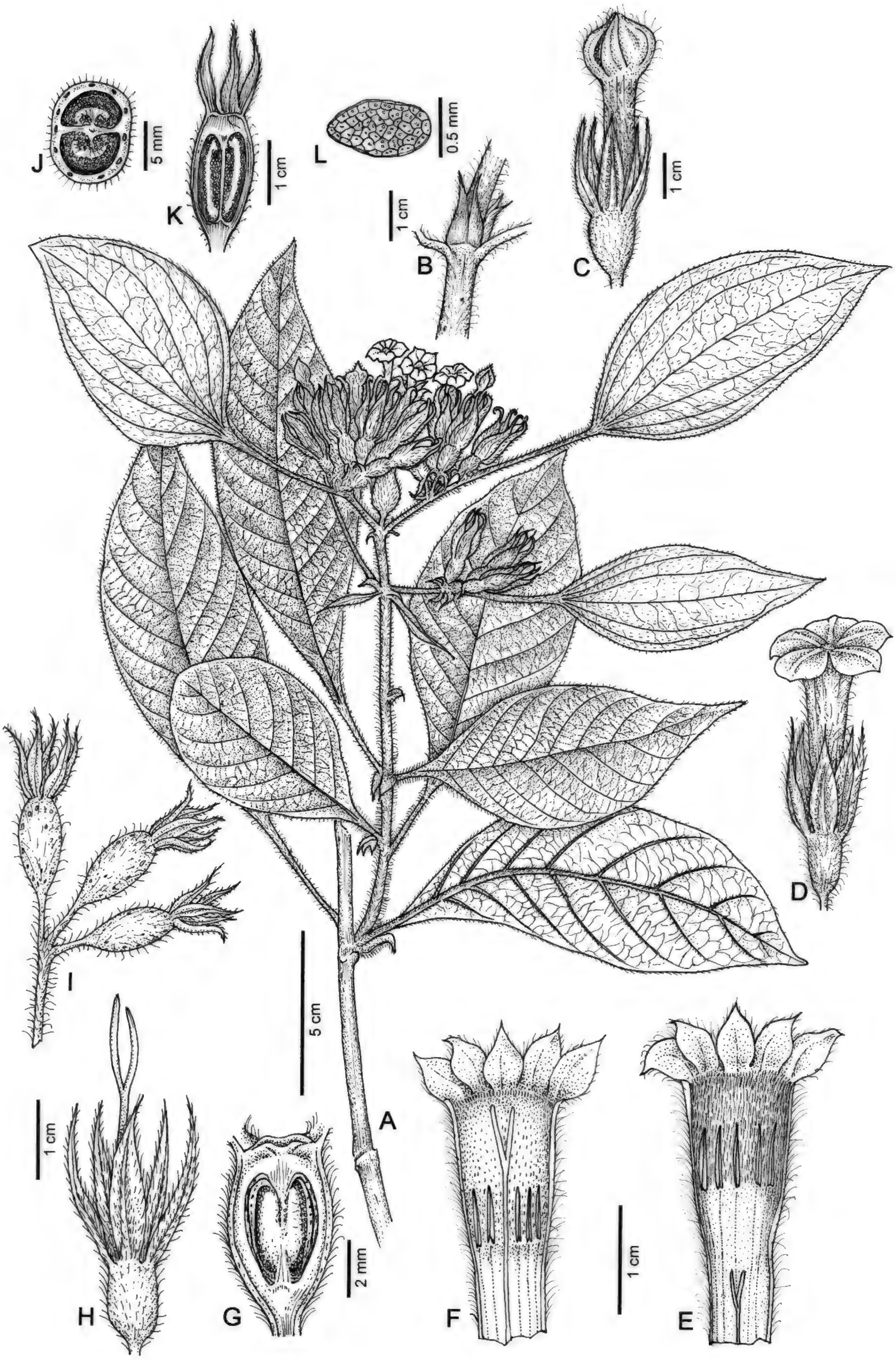

Figure 13. *Mussaenda multibracteata* Merr. —A. Flowering branch. —B. Portion of stem showing stipule. —C. Flower bud. —D. Open anthesal flower. —E. Short-styled flower morph, corolla tube dissected open in longitudinal section. —F. Long-styled flower morph, corolla tube dissected open in longitudinal section. —G. Longitudinal section through ovary. —H. Calyx, style, and stigma of long-styled flower, with the corolla removed. —I. Three fruits, showing persistent calyces. —J, K. Fruit sections showing seed attachments on placentas, in cross and longitudinal sections, respectively. —L. Seed. A–E are taken from *Alejandro 63a* (*Univ. Santo Tomas Hb.*); F–L, from *Alejandro 63b* (US).

Distribution and habitat. *Mussaenda multibracteata* is known from the provinces of Cagayan and Quezon in the Luzon Region of the Philippines. It is also known from the provinces of Camarines Norte, Camarines Sur, Catanduanes, Albay, and Sorsogon in the Bicol region to the southeast. The species has been collected in low- to high-altitude, secondary and primary forests, on riversides, streamsides, on mountainsides, on clay or sand soils, and from altitudes ranging from 150 to 2100 m.s.m.

Discussion. Merrill (1911b: 35) noted two collections, the first "*Bur. Sci. 23585 Ramos*" and a fruiting collection (*23715*), in the protologue for *Mussaenda multibracteata*. Jayaweera (1964: 124) would later lectotypify the first collection, "NY–lectotype."As Bureau of Science collections for the flora of the Philippines, duplicates would have been deposited at PNH and were destroyed during World War II.

Mussaenda multibracteata is perhaps the most distinctive species among Philippine *Mussaenda* and is characterized by its deeply bilobed stipules and long calyx tubes to 8 mm long, by its quite large, foliaceous calyx lobes to 13.5 × 2.5 mm, and by its large fruits (2.2 × 1.2 cm) with long pedicels to 6 mm. This species is more similar to African *Mussaenda* than to Asian *Mussaenda* in the size and shape of the calyx lobes (e.g., *M. grandiflora* Benth. and *M. erythrophylla*) and morphology of the fruits (e.g., *M. tristigmatica*).

Additional specimens examined. PHILIPPINES. **Albay:** Mayon Volcano, 13°15′N, 123°50′E, *Mendoza 18376* (PNH), *18431* (L, PNH). **Cagayan:** Luzon region, Mt. Dos Cuernas, 17°32′N, 121°59′E, *Ramos 77006* (PNH). **Camarines Norte:** Mt. Kadig, 14°07′N, 122°49′E, *Edaño 40230* (PNH, US). **Camarines Sur:** Mt. Isarog, 13°39′N, 123°22′E, *Alejandro 63a* (BR, NY, PNH, UBT, *Univ. Santo Tomas Hb.*, US, WAG), *63b* (L, NY, UBT, *Univ. Santo Tomas Hb.*, US), *Convocar 2820* (PNH), *Madulid 6831* (MO); Her-it river, *Clemens 17011* (NY), *Edaño 76425* (NY). **Catanduanes:** Bato trail to Viga, 13°51′N, 124°18′E, *Ramos & Edaño 75143* (NY), *75154* (NY); Mt. Tagmasusso, 13°38′N, 124°07′E, *Ramos & Edaño 75159* (NY), *75259* (NY); *Ramos 30262* (US) and *30509* (A). **Quezon:** Tayabas, Casiguran, 14°01′N, 121°37′E, *Ramos & Edaño 45480* (NY). **Sorsogon:** 12°57′N, 123°38′E, *Ramos 23715* (US).

15. **Mussaenda nervosa** Elmer, Leafl. Philipp. Bot. 3(Pt. C): 994–996. 1911. TYPE: Philippines. North Cotabato: Mindanao Region, Davao, Todaya, Mt. Apo, 07°00′N, 125°16′E, May 1909, *A. D. E. Elmer 10510* (lectotype, designated by Jayaweera [1964: 125], A [barcode] 00096198!; isolectotypes, BISH [bc] 1004486 digital image!, BM [bc] 000945225 digital image!, E [bc] 00502303 digital image!, GH [bc] 00096199 digital image!, K [bc] K000740977 digital image!, L!, MO [bc] 000716935 digital image!, NY [bc] 00132314!, US [bc] 000917557!). Figure 14.

Shrubs 3–3.5 m tall; young twigs green, sparsely pilose, the trichomes less than 12-celled, brown; older branches with few lenticels, grayish brown, glabrous. Leaf blades ovate to elliptic or lanceolate to elliptic, 6–15 × 4–6.7 cm, membranaceous to subcoriaceous, puberulous on both surfaces, especially on midrib and veins underneath, margins glabrous, apex acuminate or subcaudate, conduplicate, base acute or obtuse; secondary veins in 10 to 15 pairs, midrib and veins distinctly sunken above, including midrib; petioles 0.5–0.9 cm, sparsely pubescent; stipules triangular, 5–9 × 3–4.5 mm at the base, deciduous, abaxially with dense indument, adaxially with dense indument only at the base, apex bifid 1/4 to 3/4 of length, the stipule lobes slightly diverging or not; colleters few, in groups of 2 at the base. Inflorescences congested, densely pilose; bracts few, linear to narrowly lanceolate, entire or bilobed, 0.7–1 × 1–2 mm, densely pubescent underneath, with a few scattered trichomes at the base above; flower pedicels 1–2 mm, with densely appressed trichomes. Flowers odorless; calyx tubes cup-shaped to shortly tubular, 3.5–4.5 mm long, densely pilose; calyx lobes linear or subulate, not recurved, 14–19 × 1–1.5 mm, pubescence only in external median portion, glabrous inside, occasionally with a single calycophyll; colleters as 1 or 2 pairs per lobe, in sinuses between calyx lobes; calycophylls with blades ovate or elliptic to ovate, 5-nerved, 4–5.5 × 3–4 cm, white or yellowish white, glabrous or with scattered minute trichomes along nerves above, pubescent only on the nerves beneath, margins ciliate, apex acute, base cuneate; calycophyll stalks 0.9–1.5 cm, sparsely pubescent; corolla buds and open flowers densely pilose; corolla tubes cylindrical, forming a distinctly swollen portion around anthers, 2.5–3 cm long, yellowish white, with tuft of trichomes surrounding the opening; short-styled flower morphs with dense, long, unstriate, ribbon-like trichomes internally to the base of anthers from the top; long-styled flower morphs with sparse short, striate, ribbon-like trichomes internally to short filaments from the top; corolla lobes ovate, 5–7 × 2.5–3 mm, yellow, abaxially pilose, adaxially papillate, apex recurved, with 1–2 mm filiform apical appendages; stamens inserted to distal 1/4 in short-styled flower morphs, around middle in long-styled flower morphs, filaments glabrous, anthers linear, 6.5–7.5 mm in

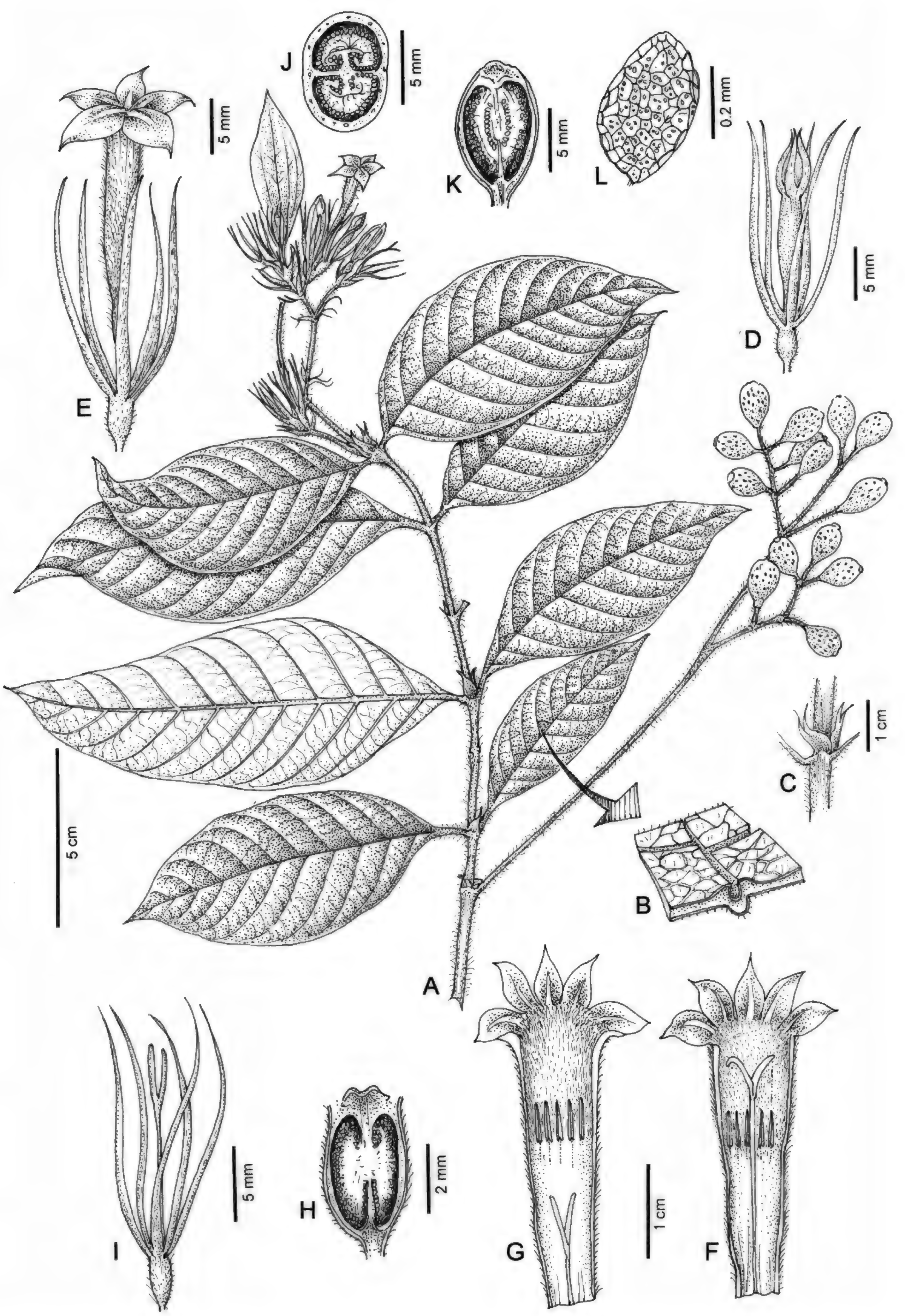

Figure 14. *Mussaenda nervosa* Elmer. —A. Flowering and fruiting branch. —B. Leaf section showing sunken midrib and veins. —C. Portion of stem, showing stipules. —D. Flower bud. —E. Open anthesal flower. —F. Long-styled flower morph, corolla tube dissected open in longitudinal section. —G. Short-styled flower morph, corolla tube dissected open in longitudinal section. —H. Longitudinal section through ovary. —I. Calyx, style, and stigma of long-styled flower morph, with the corolla removed. —J, K. Fruit sections showing seed attachments on placentas, in cross and longitudinal sections, respectively. —L. Seed. A–F, H–L are taken from *Alejandro 95* (UBT); G, from the isolectotype *Elmer 10510* (L).

short-styled flower morphs, 6–6.5 mm in long-styled flower morphs, glabrous, apex obtuse; pollen diameters to 16.2 μm, apertures 4; ovary 3–4 × 2 mm, style 5–6 mm in short-styled flower morphs, 16–18 mm in long-styled flower morphs, stigma 2–3 mm in short-styled flower morphs, 8–9 mm in long-styled flower morphs, smooth or papillose, recurved and included in long-styled flower morphs. Fruits globose or ellipsoid, 1 × 0.8 cm, with dense warts, without vertical ridges, green, calyces deciduous, usually glabrous; mesocarp 0.4–0.6 mm thick; fruiting pedicels 2 mm, glabrous or puberulous; seeds 0.46–0.6 × 0.36–0.43 mm, exotesta cells with 4 to 12 pores on the inner tangential walls, tuberculate thickenings slightly prominent.

Local name. Buyan (Bgb), according to Alejandro (pers. obs.).

Phenology. Mussaenda nervosa has been observed in flowers and fruits in May and November to December.

Distribution and habitat. Mussaenda nervosa is endemic to the Mindanao Region in the southern Philipines and is known from the provinces of North Cotabato, Misamis Occidental, and Bukidnon. The species has been collected in evergreen rainforests, or along dry creek valleys bordered by grasslands, on clay or loam soils, and from altitudes of 1000–1350 m.s.m.

Discussion. Elmer (1911: 995) cited only one collection, his "Type specimen 10510," which Jayaweera (1964: 125) would later lectotypify "A–lectotype; GH, NY, US–isotypes." Additional isolectotypes (BISH, BM, E, K, L, and MO) have been found, although Elmer's type at PNH was destroyed during World War II.

Mussaenda nervosa can be easily recognized by the sunken midribs and secondary veins on the abaxial leaf surface. No other Philippine *Mussaenda* species possesses this character except for the slightly sunken midribs of *M. milleri*. Additionally, *M. nervosa* is distinguished by its sparsely pilose young twigs that become glabrous, by its conduplicate leaves, by its short bracts to 1 mm long, and by the presence of trichomes only on the median external surface of the calyx lobes. This species is distantly similar to *M. philippinensis* by its long calyx lobes to 19 mm that cover the entire corolla before anthesis and extend to three quarters of the corolla in open flowers (vs. calyx lobes to 15 mm and cover three quarters of the corolla before anthesis and more or less half of the corolla in open flowers in *M. philippinensis*). Also, the fruit calyces are deciduous in *M. nervosa*, whereas they are persistent in *M. philippinensis*.

Additional specimens examined. PHILIPPINES. **Bukidnon:** Kitanglad Mtn. Range, Mt. Kitanglad, 08°74′N, 124°55′E, *Alejandro 10049* (A, L, PNH, *Univ. Santo Tomas Hb.*), Sumilao Mun., Brgy. Lupiagan, 08°11′N, 124°55′E, *Ingle & Baylomo 630* (A). **Misamis Occidental:** Mindanao Region, Mt. Malindang, 08°16′N, 123°37′E, *Alejandro 95* (UBT, *Univ. Santo Tomas Hb.*).

16. Mussaenda palawanensis Merr., Philipp. J. Sci., 10(Pt. C): 103. 1915. TYPE: Philippines. Palawan: Palawan Island, Point Separation, 09°06′N, 118°07′E, July 1912, *E. Fénix 15531* (lectotype, designated by Jayaweera [1964: 127], US [barcode] 000424851!; isolectotype, K [bc] K000740976 digital image!). Figure 15.

Shrubs 2–3 m tall; young twigs green, pilose, the trichomes less than 12-celled, brown; older branches with few lenticels, reddish brown, glabrous. Leaf blades narrowly elliptic to ovate or obovate, 7–22 × 3.5–7.5 cm, membranaceous to subcoriaceous, variably pubescent on both sides, especially on midrib and veins underneath, margins ciliate, apex abruptly acuminate, not conduplicate, base obtuse or cuneate to attenuate; secondary veins in 9 to 14 pairs, prominulous above; petioles 0.5–0.9 cm, densely pubescent; stipules triangular, 8–11.5 × 5–7 mm at the base, persistent or deciduous, abaxially with dense indumentum, adaxially with dense indument only at the base; apex bifid ± half its length, the stipule lobes slightly diverging or not; colleters numerous, in groups of 2 at the base. Inflorescences congested, densely pilose to glabrate; bracts few, linear to narrowly lanceolate, entire or bilobed, 3.5–10 × 1–1.8 mm, sparsely pubescent underneath, glabrous or sparsely pubescent above. Flowers 5-merous, rarely 6-merous, odorless; flower pedicels 0.5–1 mm, with densely appressed trichomes; calyx tubes cup-shaped to shortly tubular, 4–5.8 mm long, densely pilose; calyx lobes lanceolate or subulate, not recurved, 8–14 × 1–2.5 mm, pilose on both sides, occasionally with a single calycophyll; colleters as 2 to 4 pairs per calyx lobe, in sinuses between calyx lobes; calycophylls ovate, 5-nerved, 6–8.2 × 4–6 cm, white or cream, sparsely pubescent on the nerves of both surfaces, margins ciliate, apex acuminate, base cuneate, stalks of calycophylls 0.8–1.4 cm, densely pubescent; corolla buds densely pilose, usually remaining pilose all over or only on the

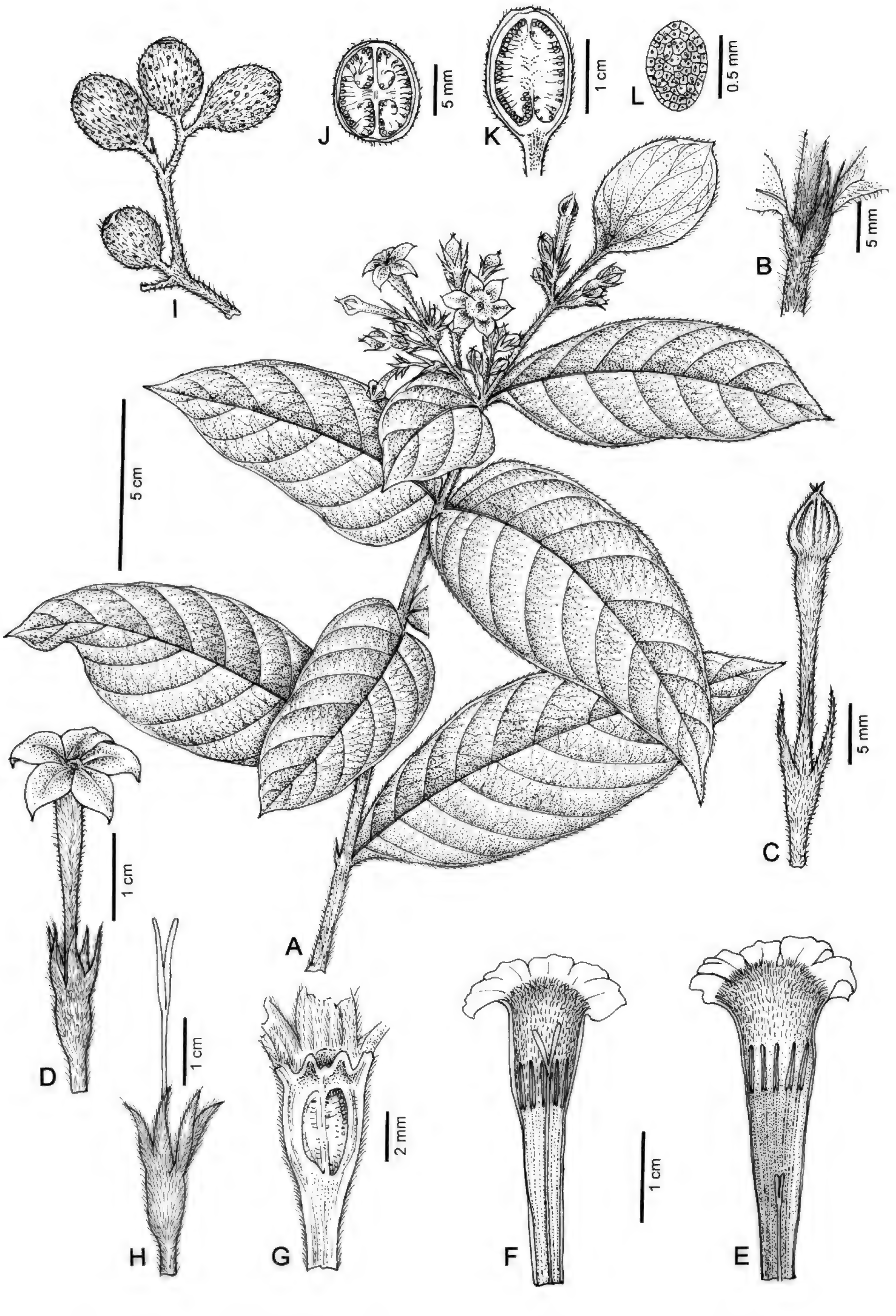

Figure 15. *Mussaenda palawanensis* Merr. —A. Flowering branch. —B. Portion of stem with stipule. —C. Flower bud. —D. Open anthesal flower. —E. Short-styled flower morph, corolla tube dissected open in longitudinal section. —F. Long-styled flower morph, corolla tube dissected open in longitudinal section. —G. Longitudinal section through ovary. —H. Calyx, style, and stigma of long-styled flower morph, with the corolla removed. —I. Portion of fertile axis with four fruits. —J, K. Fruit sections showing seed attachments on placentas, in cross and longitudinal sections, respectively. —L. Seed. A–E are taken from *Alejandro 77* (*Univ. Santo Tomas Hb.*); F–L, from *Alejandro 78* (UBT).

upper half and with few scattered trichomes below in open flowers; corolla tubes infundibular, swollen part around anthers indistinct, 2.8–3.2 cm long, yellowish white or cream, with tuft of trichomes surrounding the opening; short-styled flower morphs with densely long, unstriated, ribbon-like trichomes internally to the base of anthers from the top; long-styled flower morphs with sparsely short, striate, ribbon-like trichomes internally to the short filaments from the top; corolla lobes ovate, 5–10 × 3–3.5 mm, yellow-orange, abaxially pilose, adaxially papillate or puberulous, apex not recurved, with 2–2.5 mm filiform apical appendages; stamens inserted to distal 1/4 in short-styled flower morphs, around middle in long-styled flower morphs; filaments glabrous; anthers linear, 5–6 mm in short-styled flower morphs, 4.5–5 mm long in long-styled flower morphs, glabrous, apex acute; pollen diameters to 18.45 μm, apertures 4, rarely 3; ovary 4 × 2–2.5; style 6–8 mm in short-styled flower morphs, 19–22 mm in long-styled flower morphs; stigma 4–4.5 mm in short-styled flower morphs, 7–8 mm in long-styled flower morphs, smooth, recurved, included or semi-exserted in long-styled flower morphs. Fruits globose or ellipsoid, or obovoid, 1.2–2 × 0.9–1.4 cm, with dense warts, without vertical ridges, green, sparsely pubescent, calyces deciduous, sparsely pubescent; mesocarp 0.7–1.1 mm thick; fruiting pedicels 2–5 mm, sparsely pubescent; seeds 0.6–0.77 × 0.73–0.83 mm; exotesta cells with 3 to 8 pores on the inner tangential walls, tuberculate thickenings slightly prominent.

Local names. Bayan (Pal); Boyon (Tbw); Buyan (Pal); Malabuyon (Tag), according to Alejandro (pers. obs.).

Phenology. *Mussaenda palawanensis* has been collected in flower from February to July and in fruit March and July to August and November to December.

Distribution and habitat. *Mussaenda palawanensis* is considered to be restricted to Palawan Island and is known from Palawan and Taytay Provinces, but populations have extended to Quezon Province in the Calabarzon Region to the north and Maguindanao Province in Mindanao to the east, extending to Palmas Island, the southernmost island now in North Sulawesi, Indonesia. The species has been collected from low-altitude, occasionally mid-altitude, secondary forests, on mountainsides, on streamsides, on disturbed roadsides, on clay or sandy soils and occasionally ultramafic soils, and from altitudes ranging from 25 to 750 m.s.m.

Discussion. Merrill (1915: 103) mentioned only the one collection, "*Bur. Sci. 15531 Fénix* (type)," in his protologue for *Mussaenda palawanensis*. As a Bureau of Science collection for the flora of the Philippines, one duplicate would have been deposited at PNH and destroyed during World War II. The surviving duplicate at US was identified as "US–lectotype" in Jayaweera's treatment of Philippine *Mussaenda* (1964: 127). An additional isolectotype at K has also been found.

Mussaenda palawanensis is characterized by the long filiform appendages to 2.5 mm at corolla apices and the thick mesocarp to 1.1 mm of the fruit. Variabilty within *M. palawanensis* occurs in the density of trichomes on young twigs; size, shape, and indumentum of leaves and bracts; and divergence of the stipules. *Mussaenda palawanensis* resembles *M. philippica* var. *philippica* in the morphology of vegetative parts and *M. nervosa* based on the morphology of flowers and type of indumentum. In these three species, the size of calyx lobes is valuable for their distinction. *Mussaenda nervosa* has the longest calyx lobes (14–19 mm), followed by *M. palawanensis* (8–14 mm), and the shortest ones are found in *M. philippica* var. *philippica* (1.5–3.5[–5.5] mm). *Mussaenda palawanensis* is restricted and observed to be more common in Palawan than *M. philippica* var. *philippica*.

Additional specimens examined. PHILIPPINES. **Maguindanao:** Nara Mun., vic. Trident mine, Victoria range, 09°23′N, 118°24′E, *Soejarto & Madulid 6144* (L). **Palawan:** Puerto Princesa, Santa Lourdes, 09°47′N, 118°45′E, *Alejandro 77* (BR, L, *Univ. Santo Tomas Hb.*), *78* (BR, L, UBT), Bacungan, 09°54′N, 118°42′E, *Alejandro 72* (UBT, *Univ. Santo Tomas Hb.*, US), *73* (NY, UBT, US), *75* (L), *76* (BM, BR), Palawan State University, 09°46′N, 118°44′E, *Alejandro 66* (UBT), *67* (WAG), *68* (BM), *Kondo & Edaño 36685* (PNH), Baraki, 09°26′N, 118°31′E, *Fox 13354* (A); Tindogan Distr., Mantalingajan Mt. Range, Mt. Gantung, 08°59′N, 117°49′E, *Pipoly et al. 37956* (A, NY); Batarasa, Marangas River, 08°41′N, 117°39′E, *Alejandro 82* (PNH), *83* (PNH), *84* (*Univ. Santo Tomas Hb.*); Panacan Aborlan, Victoria Mtns., 09°00′N, 118°00′E, *Sulit 12343* (PNH); Mt. Ibugi, *Ebalo 67441* (PNH), *Ebalo & Conklin 1227* (A); Debangan Island, near Taytay, 10°49′N, 119°30′E, *Merrill 11526* (US); Balabac Island, 07°58′N, 117°02′E, *Mangubat 481* (NY, US), *Ramos & Edaño 49660* (BR). **Quezon:** Amapaplot, 09°14′N, 117°59′E, *Espiritu 91473* (PNH), Mono, *Reynoso 87760* (PNH), underground, *Cordero & Espiritu 91572* (L, PNH). **Taytay:** Taytay Mun., 10°49′N, 119°30′E, *Ridsdale 156719* (PNH); Brooke's Point, 08°46′N, 117°50′E, *Edaño 244* (A, PNH); Dalupaon, Paracao, *Bourell 2244* (A, MO, US); San Antonio Bay, 08°39′N, 117°32′E, *Merrill 867* (US). INDONESIA. **North Sulawesi:** Palmas Island [Miangas], *Merrill 5338* (NY).

17. Mussaenda philippica A. Rich., Mém. Soc. Hist. Nat. Paris 5: 245. 1834. TYPE: Philippines. Nat. Capital Region: Manila, 1819, *G. S. Perrottet s.n.* (holotype, P [barcode] P000237778!).

Shrubs or trees 1.5–8 m tall; young twigs green to grayish brown, glabrous or puberulous, rarely pilose, the trichomes less than 12-celled, white to brownish white; older branches with few to many lenticels, reddish or grayish brown, glabrous. Leaf blades elliptic to ovate, or obovate, 3.5–23.5 × 2–12 cm, membranous to subcoriaceous, glabrous or pubescent on both sides, especially on midrib and veins underneath, margins glabrous or ciliate, rarely slightly sinuate, apex acuminate or subcaudate, rarely conduplicate, base cuneate or long attenuate; secondary veins in 6 to 15 pairs, prominulous above; petioles 0.2–5 cm, glabrous or pubescent; stipules triangular, or ovate, 3–12 × 2–7 mm at the base, persistent or deciduous, abaxially glabrous to puberulous, or pubescent, adaxially pubescent all over or only at the base, apex bifid 1/8 to 3/4 of length, the stipule lobes slightly diverging or not; colleters few or numerous, in continuous rows or in groups of 2 at the base. Inflorescences spreading or congested, glabrous or puberulous, rarely densely pilose; bracts few, linear, lanceolate, or ovate, entire to trilobed, 2.5–5 × 0.8–1.7 mm, pubescent underneath, glabrous above. Flowers odorless; flower pedicels 1–3 mm, with appressed or ascending trichomes; calyx tubes cup-shaped to shortly tubular, 3.5–5 mm long, glabrous or pubescent; calyx lobes lanceolate or subulate, rarely recurved, 1.5–3.5(–7) × 1.5–2 mm, pubescent outside, glabrous or pubescent inside, occasionally with a single calycophyll or all developed into calycophylls; colleters as 1 to 4 pairs per lobe, in sinuses between calyx lobes; calycophylls elliptic to ovate or orbicular, 5-nerved, 3.5–13 × 2–8.5 cm, white or cream, glabrous or puberulous along venation of both surfaces, margins ciliate or glabrous, apex apiculate or acuminate, base cuneate or attenuate, calycophyll stalks 0.5–2 cm, puberulous or pubescent; corolla buds densely pubescent, remaining pubescent or only on the upper half and with few scattered trichomes below in open flowers; corolla tubes cylindrical, forming a distinctly swollen part around anthers, 1.5–3 cm long, cream or greenish white, with or without tuft of trichomes surrounding the opening; short-styled flower morphs with dense, long, unstriate, ribbon-like trichomes internally to the base of anthers from the top; long-styled flower morphs with short, striate, straplike trichomes internally to the base of anthers or to the short filaments from the top; corolla lobes ovate, 4–8 × 2.5–5 mm, yellow or yellow-orange, abaxially pubescent, adaxially papillate; apex recurved or not, with 0.5–2 mm filiform apical appendages; stamens inserted to distal 1/4 in short-styled flower morphs, around middle in long-styled flower morphs, filaments glabrous, anthers linear to lanceolate, 5–6.5 mm in short-styled flower morphs, 5–5.5 mm in long-styled flower morphs, glabrous, apex acute; pollen diameters 15.75–16.65 μm, apertures 4, rarely 3; ovary 3.5–5 × 1.5–2.5 mm, style 3–7 mm in short-styled flower morphs, 10–24 mm in long-styled flower morphs, stigma 1.5–4 mm in short-styled flower morphs, 3–9 mm in long-styled flower morphs, smooth or papillose, recurved or not, included, or semi-exserted in long-styled flower morphs. Fruits globose or ellipsoid, or obovoid, 1–1.8 × 0.8–1.1 cm, with sparse to dense warts, without vertical ridges, green, dark brown when ripe, calyces deciduous, glabrous or puberulous; mesocarp 0.7–1.1 mm thick; fruiting pedicels 2–5(–7) mm, glabrous or puberulous; seeds 0.45–0.98 × 0.35–0.8 mm; exotesta cells with 2 to 7 pores on the inner tangential walls, tuberculate thickenings slightly prominent or inconspicuous.

Discussion. Although Jayaweera (1964: 128) identified the type for *Mussaenda philippica* to an unnumbered *Perrottet* collection, he did not include its citation (1964: 129–130) among the many specimens in his taxonomic treatment of the species. The type specimen *Perrottet s.n.* collected in 1819 (Perrottet, 1834: 245) was only recently located by the authors at the Paris herbarium.

KEY TO THE VARIETIES OF *MUSSAENDA PHILIPPICA* IN THE PHILIPPINES

1a. Young twigs and inflorescences glabrous or puberulous; leaf blades puberulous abaxially, rarely conduplicate at apex; corolla lobes with apical appendages 1 mm or longer.
  2a. Calyx tube pubescent; calyx lobes all developed into calycophylls .... 17a. *M. philippica* A. Rich. var. *aurorae* Sulit
  2b. Calyx tube puberulous at the most; calyx lobes occasionally with a single calycophyll ..... 17b. *M. philippica* A. Rich. var. *philippica*
1b. Young twigs and inflorescences pilose; leaf blades densely pubescent abaxially, strongly conduplicate at apex; corolla lobes with apical appendages less than 1 mm long .... 17c. *M. philippica* A. Rich. var. *pubescens* Alejandro

17a. Mussaenda philippica var. **aurorae** Sulit, Philipp. J. Forest. 2(1): 39, pl. 3, fig. 1. 1939. *Mussaenda philippica* f. *aurorae* (Sulit) Jayaw., J. Arnold Arbor. 45: 131. 1964. TYPE: Philippines. Laguna: Tungtungin, Mt. Balong,

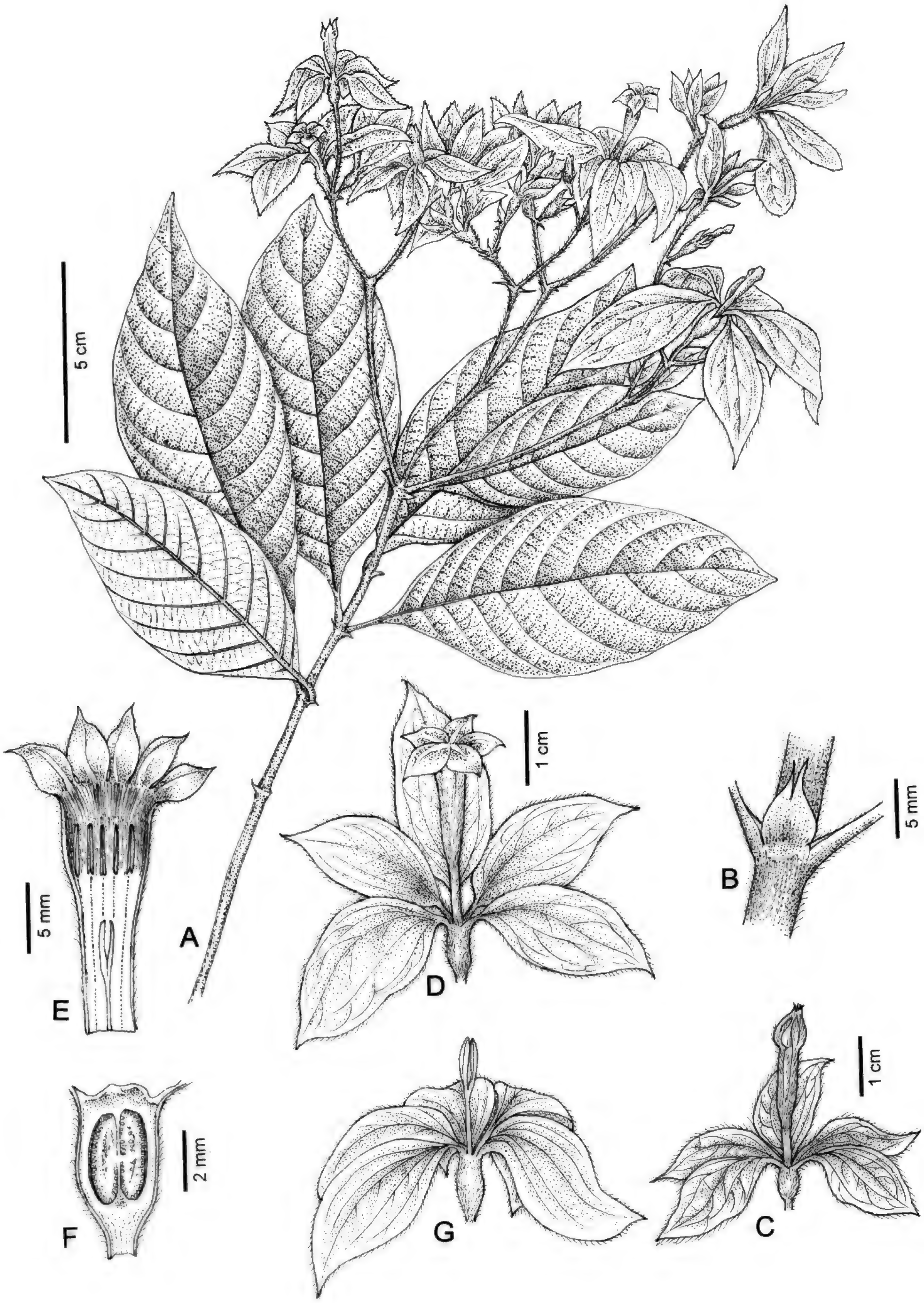

Figure 16. *Mussaenda philippica* A. Rich. var. *aurorae* Sulit. —A. Flowering branch. —B. Portion of stem with stipule. —C. Flower bud. —D. Open anthesal flower, with calyx lobes developed as calycophylls. —E. Short-styled flower morph, corolla tube dissected open in longitudinal section (long-styled flower morph not seen). —F. Longitudinal section through ovary. —G. Calyx, style, and stigma of short-styled flower morph, with the corolla removed. A–G are taken from *Alejandro 9* (UBT).

14°10′N, 121°15′E, July 1915, *C. Mabesa 24876* (lectotype, designated by Jayaweera [1964: 132], A [barcode] 00295695!; isolectotypes, L [bc] 00064859!, US [bc] 000137859!). Figure 16.

Shrubs 1.5–3 m tall; young twigs puberulous. Leaf blades 8–16 × 3.2–8.5 cm, puberulous on both surfaces, margins ciliate, apex not conduplicate; secondary in 8 to 10 pairs; petioles 0.7–1.5 cm, sparsely to densely pubescent; stipules triangular, 3.5–7 × 2–5 mm at the base, abaxially with dense indument, adaxially with sparse indument only at the base; apex bifurcate ± half of length, the stipule lobes not diverging. Inflorescences puberulous; bracts entire or bilobed, 3.5–4 × 1–1.7 mm, densely pubescent underneath. Flowers with the pedicels 1–2.5 mm; calyx tubes 3.5–4 mm, pubescent; calyx lobes recurved, all developing into calycophylls; colleters 2 or 3 pairs per lobe; calycophylls 3.5–7 × 2–5.5 cm, puberulous along nerves of both surfaces, margins ciliate, base cuneate; calycophyll stalks 0.6–1 cm, densely pubescent; corolla tubes 1.5–2.3 cm long, with tuft of trichomes surrounding the opening; corolla lobes 4–6 × 4–4.5 mm; apex recurved, filiform apical appendages 1–1.5 mm; anthers 6 mm in short-styled flower morphs; pollen diameters to 15.75 μm; ovary 3.5–4 × 1.5–2 mm, style 3–4 mm in short-styled flower morphs, stigma 3.5–4 mm in short-styled flower morphs; long-styled flower morphs not seen. Fruits not seen.

Local names. Agboy (Myn, Tag); Doña-Aurora; Tawa-tawa (Bkd), according to Alejandro (pers. obs.).

Phenology. Mussaenda philippica var. *aurorae* has been observed to flower from May to December (probably throughout the year), but not in fruit.

Distribution and habitat. Mussaenda philippica var. *aurorae* is endemic to Laguna, a province in central Luzon, and has also been collected in nearby Manila. This variety is cultivated in Los Baños or is known from secondary forests, on clay, humid soils, and at altitudes ranging from 100 to 250 m.s.m.

Discussion. Jayaweera (1964: 132) selected the type for his new form *Mussaenda philippica* f. *aurorae* as "A–lectotype; US–isotype." Since then, the authors have identified a second isolectotype at L.

Mussaenda philippica var. *aurorae* is unique in having five enlarged calyx lobes (3.5–7 × 2–5.5 cm). Exclusive of calycophylls, the variety closely resembles *M. philippica* var. *philippica* in vegetative and reproductive structures. The variety *aurorae* has been one of the parent taxa of the quite different and colorful Philippine *Mussaenda* cultivars.

Additional specimens examined. PHILIPPINES. **Laguna:** Luzon, Los Baños, University of Philippines, Forestry College, 14°16′N, 121°07′E, *Fosberg 35018* (L, NY, US), *Steiner 40038* (PNH), *Walker 7456* (US), Mt. Makiling, 14°09′N, 121°02′E, *Alejandro 9* (BR, UBT, *Univ. Santo Tomas Hb.*), *Salvoza 3215* (PNH). **National Capital Region:** Manila, Manila gardens, 14°35′N, 120°59′E, *Steiner 22830* (PNH), *82016* (PNH), *Quisumbing 2101* (PNH).

17b. **Mussaenda philippica** A. Rich var. **philippica**. Figure 17.

Shrubs or trees 2–8 m tall; young twigs glabrous or puberulous. Leaf blades 3.5–23.5 × 2–12 cm wide, glabrous or puberulous on both surfaces, apex rarely conduplicate, margins slightly sinuate; secondary veins in 6 to 15 pairs; petioles 0.2–5 cm, glabrous or puberulous; stipules 3–11 mm; apex bifurcate 1/4 to 3/4 of length; colleters in groups of 2 at the base. Inflorescences glabrous or puberulous; bracts 2.5–5 × 0.8–1.5 mm. Flower pedicels 1.5–3 mm; flowers with calyx tubes 4–5 mm, glabrous or puberulous; calyx lobes usually puberulous and 2–3.5(–5.5) × 1.5–2 mm in long-styled flower morphs, usually glabrous and toothlike or reduced to 2 mm long in short-styled flower morphs, occasionally with a single calycophyll; calycophylls 4–13 × 3–8.5 cm, base cuneate; calycophyll stalks 1.5–2 cm, puberulous; corolla tubes 1.8–3 cm long, with or without tuft of trichomes surrounding the opening, in long-styled flower morphs with sparse trichomes inside; corolla lobes 5–8 × 2.5–5 mm; apex recurved, filiform apical appendages 1–2 mm; pollen diameters to 16.65 μm; ovary 4–5 mm; style 3–7 mm in short-styled flower morphs, 16–24 mm in long-styled flower morphs, stigma 2–4 mm in short-styled flower morphs, 5–9 mm, included or semi-exserted in long-styled flower morphs.

Local names. Agboy (BisPn); Ati-ati (Bis); Ayaw na kilat (Mgd); Ayon-a-kilat (Mar); akawan (MboBl); Balay-lamok, Bali-lamok (Ilk); Balikarap (Tag); Bayoyo, Boyon (BisSL); Buyan-bulagan (Sub); Buyon (BisC, BisSL, Tbw, Tsg); Buyon-buyon (Pal); Darumabi (Mgd); Gatas-birhen (Tag); Gibing-gibing, Gibuyan (Sub); Humbabuyin, Hunbabuyan, Hunbabuyun (Tag); Kahoy-dalaga (Tag); Kambubuyun buladlad (Han); Katuday-bantay (Ilk); Kayum dalaga (SblPn); Labayon (Sub); Langla (Sbl); Mabiyun, Mabiyun-tama (Bng); Makaden (Tbl); Muyon (Mbo); Pulog-pulog (Dgt); Saguyepyep (Ilk); Selimantew (Mbo); Sigidago (Tbw); Taba-taba (Bik); Talig-harap

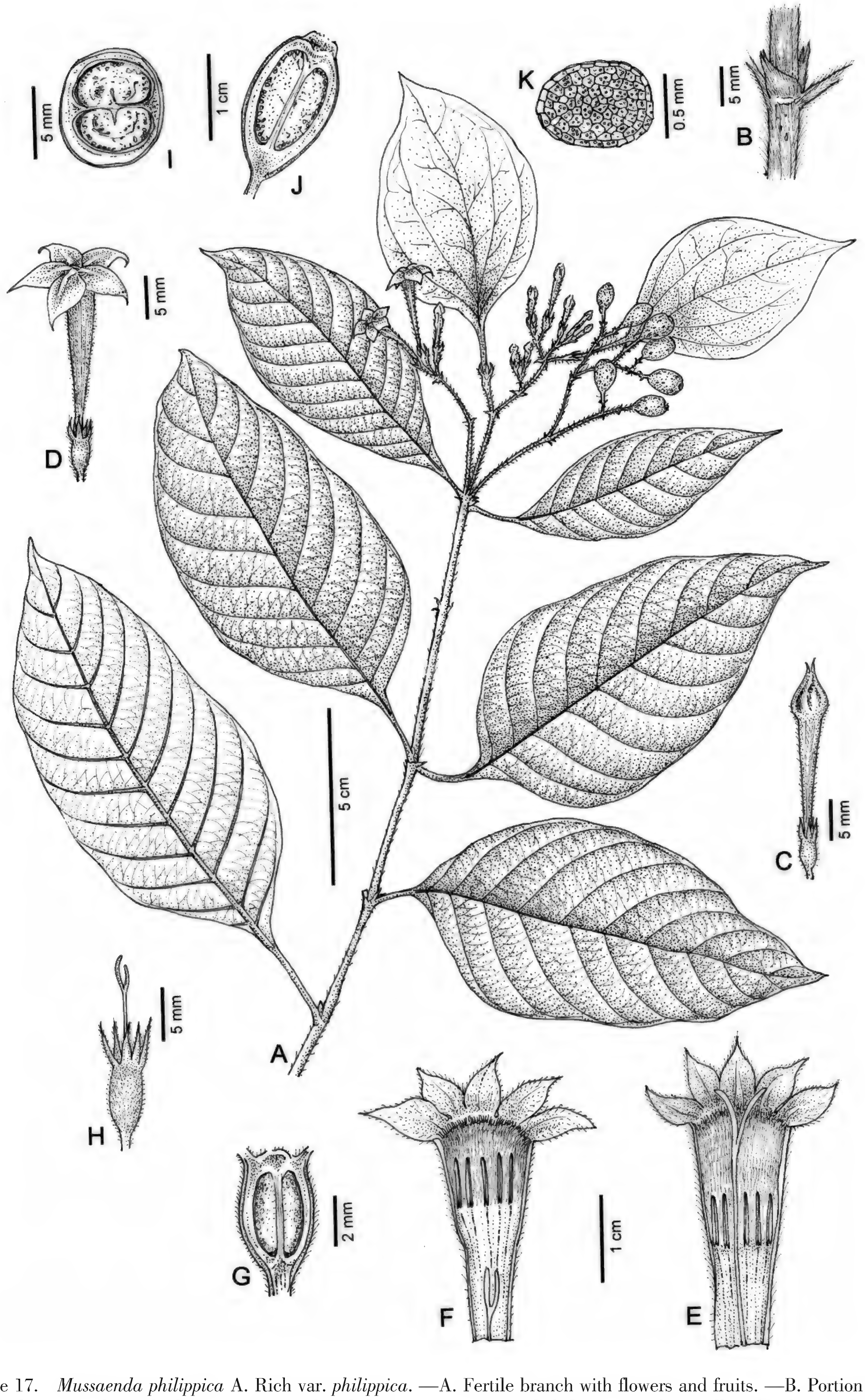

Figure 17. *Mussaenda philippica* A. Rich var. *philippica*. —A. Fertile branch with flowers and fruits. —B. Portion of stem with stipule. —C. Flower bud. —D. Open anthesal flower. —E. Long-styled flower morph, corolla tube dissected open in longitudinal section. —F. Short-styled flower morph, corolla tube dissected open in longitudinal section. —G. Longitudinal section through ovary. —H. Calyx, style, and stigma of short-styled flower morph, with the corolla removed. —I, J. Fruit sections showing seed attachments on placentas, in cross and longitudinal sections, respectively. —K. Seed. A–E, G–K are taken from *Alejandro 8* (WAG); F, from *Alejandro 7* (UBT).

(Tag); Tangawan (Tas); Tatawatawa (Mbo); Tawa-tawa (Bik, Bkd); Tinga-tinga, Tinulung-gatas (Tag), according to Madulid (2001) and Alejandro (pers. obs.).

Phenology. *Mussaenda philippica* var. *philippica* has been observed in flower throughout the year, with fruiting from January to February, April to June, and August to December.

Distribution and habitat. *Mussaenda philippica* var. *philippica* is widely distributed throughout the Philippines, from the Luzon to Mindanao Regions. In the Philippines, the autonymic variety is known mostly from low to mid-altitudes, occasionally high altitude, in secondary and primary forests, or savanna forests, on coastal scrubs and thickets, on disturbed roadsides, on riversides and streamsides, mostly on clay-loamy or sandy soils, occasionally ultramafic soils, and altitudes range from sea level to 1400 m.s.m.

Discussion. *Mussaenda philippica* var. *philippica* is highly variable in the shape, size, and indumentum of the leaves, stipules, flowers, and fruits. This variety is marked by glabrous to puberulous plant parts and the slightly sinuate margins of the leaves. More often, but not always, the short-styled flower morphs are glabrous and have toothlike or greatly reduced calyx lobes (to 2 mm long) comparable to African species of *Mussaenda* such as *M. isertiana*, *M. microdonta*, and *M. polita* and Asian species such as *M. reinwardtiana*. In contrast, the long-styled flower morphs are puberulous and with longer calyx lobes to 2–3.5(–5.5) mm. *Mussaenda philippica* var. *philippica* is highly similar to *M. pinatubensis* in the puberulent indumentum (or glabrous condition) of vegetative and reproductive parts and also to *M. palawanensis* in the appearance of plant parts. However, *M. philippica* var. *philippica* stipules are bifurcate one fourth to three fourths of their length from the apex (vs. one fourth of length in *M. pinatubensis* and one half of length in *M. palawanensis*), and a more striking contrast is the shorter length of its calyx lobes to 1.5–3.5(–5) mm (vs. 7–8 mm in *M. pinatubensis* and 8–14 mm in *M. palawanensis*). This variety is by far the most frequently collected and widely distributed taxon of the genus in the Philippines. On the other hand, *M. pinatubensis* is restricted to Pampanga and Zambales Provinces (Luzon), while *M. palawanensis* is distributed in the Palawan extending to Quezon and Maguindanao Provinces and to North Sulawesi, Indonesia.

Additional specimens examined. PHILIPPINES. **Agusan del Norte:** Butuan, Tungao, San Mateo Bo., 08°46′N, 125°37′E, *Banzon 128204* (PNH), *Mendoza 2009* (PNH), *42398* (PNH, US); Cabadbaran, Mt. Urdaneta, 09°07′N, 125°32′E, *Elmer 13301* (NY). **Aklan:** Panay Island, Nabas, Mt. Laserna, 11°49′N, 122°05′E, *Alejandro 19* (NY), *33* (PNH, *Univ. Santo Tomas Hb.*), *34* (PNH), *35* (US, WAG), Buruanga, Brgy. Tigum, Mt. Mangamura, 11°50′N, 121°53′E, *Alejandro 41* (NY, *Univ. Santo Tomas Hb.*), *45* (UBT), *55* (L, PNH), *57* (US), Ibajay, Brgy. Tagbaya, Mt. Bubog, 11°49′N, 122°09′E, *Alejandro 21* (BM), *22* (UBT), *23* (US), *24* (NY), *25* (UBT). **Albay:** Bicol region, Mt. Mayon, 13°15′N, 123°40′E, *Mendoza 18327* (PNH), *18350* (PNH). **Apayao:** Luzon, Calanasan, Tanglagan, Mt. Durar-agan, 16°39′N, 120°29′E, *Alejandro 102* (PNH, *Univ. Santo Tomas Hb.*). **Aurora:** Baler, 14°01′N, 121°35′E, *Quisumbing 2054* (PNH), *Escritor 21192* (MO); Casiguran, 16°17′N, 122°07′E, *Ramos & Edaño 45292* (NY). **Bataan:** Lamao River to Mt. Mariveles, 14°29′N, 120°09′E, *Bartlett 14653* (NY, PNH), *Borden 1220* (NY, US), *Elmer 6673* (NY), *Whitford 388* (NY), *524* (NY), *Williams 127* (A, NY); Limay, Kuyapo, 14°33′N, 120°35′E, *Alejandro 10* (NY), *11* (L), *12* (*Univ. Santo Tomas Hb.*). **Batangas:** San Juan, Brgy. Hugom, Sitio Biga, 13°46′N, 121°05′E, *Alejandro 58* (L, NY), *59* (L, NY). **Bukidnon:** vic. Tanculan, 08°08′N, 124°58′E, *Fenix 26030* (NY). **Cagayan:** Babuyan island group, Calayan Island, Mt. Makiling, 19°17′N, 121°27′E, *Quisumbing & del Rosario 79792* (PNH); Bagio Cove, 18°06′N, 121°43′E, *Allen 150272* (PNH), Lagum, vic. Penablanca, *Adduru 218* (MO), Tuguegarao, *Bolster 136* (MO), *Velasco 24852* (NY), *Cuming 1368* (MO); Sulu, 06°59′N, 118°28′E, *Mearns 36* (US), *37* (US). **Camarines Norte:** Bicol Nat. Park, 14°05′N, 122°56′E, *Canicosa 9765* (PNH), *Hallier 1903* (NY). **Camarines Sur:** Carambola, Pili, 13°15′N, 123°48′E, *Convocar 2945* (A, MO, PNH); Dalupaon, Paracao, 13°33′N, 122°58′E, *Bhern 802* (US), *Ahern 818* (US), *Bermejos 350* (A, NY, US); Kamugong River, *Edaño 75879* (NY); Paracale, *Ramos & Edaño 33469* (NY); W slope of Mt. Malinaoc, near Buhi, 13°28′N, 123°33′E *Burley 95* (A [2], WAG); Naga City, Panicuason, Mt. Isarog Nat. Park, 13°37′N, 123°10′E, *Alejandro 64* (PNH, *Univ. Santo Tomas Hb.*), *Delprete 6458* (NY), Mt. Isarog, 13°39′N, 123°22′E, *Merrill 413* (A [2], MO, NY, US), *Madulid 6841* (A [2], MO); Nueva Caceres, *Vidal 1457* (A [2]). **Capiz:** Libacao, 11°29′N, 122°17′E, *Martelino & Edaño 35331* (NY), *Edaño 46220* (NY), Dumarao, 11°15′N, 122°40′E, *Taleon 33828* (PNH); central Panay, Mt. Kudkuran, 11°09′N, 122°30′E, *Jocano 40696* (PNH). **Cotabato:** Bugasan to Parang, 07°24′N, 124°17′E, *Edaño 1527* (PNH), S Cotabato, Tasaday, 06°17′N, 124°48′E, *Gutierrez & Reynoso 108958* (PNH). **Davao:** Magdug River, 07°22′N, 126°32′E, *Edaño 11074* (PNH), Catalnan, 07°04′N, 125°31′E, *Kanehira 2497* (NY), Madaum, 07°22′N, 125°48′E, *Edaño 1312* (PNH), Santa Cruz, 06°50′N, 125°24′E, *Williams 2854* (NY), Davao city, Maa Distr., Langub hills, 07°06′N, 125°37′E, *Alejandro 94* (L, PNH), Malagos Watershed Nat. Park, near Phil. Eagle Sanctuary, 07°10′N, 125°27′E, *Alejandro 91* (BR, UBT), Todaya Distr., Mt. Apo, 07°00′N, 125°16′E, *Alejandro 93* (UBT, *Univ. Santo Tomas Hb.*), *DeVore & Hoover* 172 (MO). **Guimaras:** Guimaras Island, Buena Vista Bo., 10°39′N, 122°38′E, *Sulit 11804* (PNH). **Ilocos Norte:** Pagudpud, Patapat Mtns., 16°36′N, 120°20′E, *Alejandro 103* (UBT), *104* (UBT), *105* (UBT), *106* (UBT, *Univ. Santo Tomas Hb.*). **Iloilo:** La Rido Hill, Lambunao, 11°32′N, 122°28′E, *Reynoso et al. 17905* (A), *Gammill 261* (NY, US). **Isabela:** Sierra Madre Mtns., 17°02′N, 122°11′E, *Gutierrez 77986* (PNH); Palanan, 17°02′N, 122°25′E, *Mcgregor 10726* (NY). **Laguna:** Los Baños, 14°13′N, 121°08′E, *Elmer 8134* (NY), *Fosberg 35017* (NY, US), *Mendoza 12224*

(PNH, US); Mt. Makiling, 11°29′N, 121°08′E, *Elmer 17670* (MO, NY), *Sulit 9747* (PNH); Makiling Nat. Park, *Salvoza 3214* (BR, PNH), U.P.L.B., *Alejandro 7* (UBT, *Univ. Santo Tomas Hb.*), *Price 509* (PNH), *Steiner 40063* (PNH), ca. 100 m outside botanical garden, *Alejandro 8* (WAG), Inst. Pl. Breeding (IPB), *Alejandro 4* (BR), Pangil, 14°24′N, 121°28′E, *Ramos 39882* (PNH, US); Lumban, 14°17′N, 121°27′E, *Demetrio & Mendoza 36232* (PNH); W of Famy, 14°36′N, 121°19′E, *Brenner 2584* (PNH). **Lanao:** Cotabato to Dansalan, 07°12′N, 124°14′E, *Zwickey 34* (NY). **Leyte:** Tacloban, 11°13′N, 124°59′E, *Frohne 35140* (PNH), Palo, 11°08′N, 125°00′E, *Elmer 7045* (NY), *Wenzel 57* (MO), *179* (MO). **Mindoro Oriental:** Mindoro Island, Mansalay, 12°31′N, 121°26′E, *Merrill 912* (MO, NY, US), Mt. Yagaw, E slope, 12°35′N, 121°29′E, *Sulit & Conklin 16840* (PNH), *16875* (PNH), Puerto Galera, Biological Station, 1 Dec. 1953, *Velasquez s.n.* (A); Sablayan, Ligaya, 12°51′N, 120°48′E, *Reed 40835* (PNH). **Misamis Occidental:** Mt. Malindang, 08°17′N, 123°37′E, *Mearn & Hutchiuson 4716* (NY). **National Capital Region:** Manila, *Deguchi et al. 6303* (MO); Pasig, Blvd., 14°47′N, 121°31′E, *Mendoza 3126* (PNH). **Negros Oriental:** Negros Island, Dumaguete (Cuernos Mtns.), 09°18′N, 123°17′E, *Elmer 10121* (L, MO, NY). **Palawan:** Culion Island, 11°49′N, 119°58′E, *Bermejor 182* (NY, US); Puerto Princesa, Santa Lourdes, 09°47′N, 118°45′E, *Alejandro 79* (UBT), *80* (BM), *Danao 19907* (NY), Mt. Pulgar, 09°44′N, 118°43′E, *Elmer 12792* (A [2], MO, NY), *Cenabre 29149* (A), Irawan, Limpapay, 09°53′N, 118°43′E, *Alejandro 70* (L, US), Impapai forest behind BFD field station, E slope of Mt. Beaufort, *Soejarto & Fernando 7301* (A), Bacungan, 09°54′N, 118°41′E, *Alejandro 74* (UBT, *Univ. Santo Tomas Hb.*); Batarasa, Marangas River, 08°41′N, 117°38′E, *Alejandro 85* (*Univ. Santo Tomas Hb.*); *Curran 4517* (NY, US), *Foxworthy 605* (A, NY, PNH, US), *691* (NY); Taytay, 10°48′N, 119°28′E, *Merrill 9332* (A [2], MO, NY). **Pangasinan:** Umingan, Brgy. Annam, Mt. Umingan, 15°59′N, 120°55′E, *Alejandro 99* (PNH, *Univ. Santo Tomas Hb.*), *100* (*Univ. Santo Tomas Hb.*). **Quezon:** Tayabas, Lucena, 13°56′N, 121°36′E, *Merrill 2890* (NY); Polilio Island, Bo. Balai-balai, 14°50′N, 121°56′E, *Salvoza 3450* (PNH); Karlagan, *Fox 9021* (A, PNH), *Robinson 6847* (L); Alabat Island, Casiguran, 14°07′N, 122°00′E, *Ramos & Edaño 48089* (NY). **Rizal:** Antipolo, 14°34′N, 121°10′E, *Merrill 1341* (NY), *Vidal 389* (A), *Ramos & Edaño 29536* (A); Bosoboso, 14°38′N, 121°14′E, *Merrill 2655* (NY). **Samar:** Baruz, Matuguinao, 12°07′N, 124°53′E, *Gatchalian 15493* (PNH); Pinabacdao, Bo. Obayan, 11°36′N, 124°59′E, *Conese 15797* (PNH); Borongan, Pinamagasan, 11°36′N, 125°26′E, *Castro 5853* (PNH), Tagaslian, 11°33′N, 125°26′E, *Castro 5810* (PNH); Oras, Bantayan, Kadapnan Bo., 12°09′N, 125°25′E, *Castro 5782* (PNH); Laquilacon, 11°47′N, 125°05′E, *Mcgregor 43797* (NY), *Sulit 6125* (PNH); Catamaran, 12°28′N, 124°36′E, *Alcasid & Oane 39863* (PNH), Mt. Cansayao, 12°29′N, 124°37′E, *Sulit 14449* (PNH), Catubig River, 12°34′N, 125°00′E, *Sablaya 45* (MO); Tubabao Island, 12°06′N, 125°33′E, *Quisumbing 2045* (PNH); Mt. Purog, *Edaño 15450* (A); Basey, Brgy. Guirang, Sitio Wespal, Sohoton National Park, 11°17′N, 125°40′E, *Alejandro 10164* (*Univ. Santo Tomas Hb.*). **Sorsogon:** Irosin, Mt. Bulusan, 12°42′N, 124°02′E, *Edaño & Gutierrez 37744* (PNH), *38555* (PNH), *Elmer 14388* (MO, NY), Bulusan, Dangkalan, 12°45′N, 124°08′E, *Alejandro 61* (BR, WAG), Mt. Juban, 12°50′N, 123°58′E, *Edaño 37164* (PNH), *37163* (PNH), *Curran 10535* (NY). **Surigao del Sur:** *Ahern 339* (US). **Zambales:** Palauig, Mt. Tapulao, 15°25′N, 119°54′E, *Alejandro 96* (L), *97* (UBT); Anuling, 15°45′N, 120°03′E, *Ramos & Edaño 44543* (NY); Mt. Pinatubo, 15°07′N, 120°21′E, *Fox 4586* (PNH). **Zamboanga del Norte:** Mindanao, near Kabasalan, Mt. Muralong, 07°47′N, 122°44′E, *Ebalo 718* (PNH), Dikus, 07°48′N, 122°08′E, *Frake 36058* (PNH), *38115* (PNH), Duhinob River, 08°30′N, 123°11′E, *Frake 20332* (PNH).

17c. Mussaenda philippica var. **pubescens** Alejandro, var. nov. TYPE: Philippines. Davao Oriental: Mindanao, Mati, 06°57′N, 126°12′E, Mar.–Apr. 1927, *Bureau of Science 49315* (*M. Ramos with G. Edaño*) (holotype, NY [barcode] 00689070!). Figure 18.

Haec varietas ab aliis varietatibus speciei corolla ante anthesin dense pubescente, ramis et axibus inflorescentiarum dense pilosis et apicibus foliorum conduplicatis differt.

Shrubs 6 m tall; young twigs ± pilose. Leaf blades 4.5–15.5 × 3.5–8 cm, puberulous above, densely pubescent underneath, margins ciliate, conduplicate, base attenuate; secondary veins in 8 to 12 pairs; petioles 0.2–1 cm, densely pubescent; stipules triangular, 6–12 × 3–5.5 mm at the base, abaxially with dense indument, adaxially with sparse to dense indument; apex bifurcate 1/8 to ± half of length, the stipule lobes not diverging; colleters in groups of 2 at the base. Inflorescences congested, densely pilose; bracts 3.5–5 × 0.8–1.3 mm, densely pubescent underneath, with few scattered trichomes above; flower pedicels 1–2.5 mm, with densely appressed trichomes. Flowers with the calyx tubes 3.5–4.5 mm long, densely pubescent; calyx lobes 5–7 × 1–1.2 mm, not recurved, pubescent on both sides (denser outside and sometimes only in the lower half), occasionally with a single calycophyll; calycophylls 3.8–8.5 × 3.5–6.8 cm, puberulous on both sides, especially along the nerves, margins ciliate, base attenuate; calycophyll stalks 0.5–1.4 cm, densely pubescent; corolla tubes 2.3–2.5 cm long, without tuft of trichomes surrounding the opening; long-styled flower morphs with sparsely to densely short trichomes inside; corolla lobes 4–5 × 3.8–4.2 mm; apex not recurved, filiform apical appendages 0.5 mm; anthers 5–6 mm in short-styled flower morphs, 4–5 mm in long-styled flower morphs; ovary 3–4 × 2–2.5 mm, style 4.5–5 mm in short-styled flower morphs, 10 mm in long-styled flower morphs, stigma 1.5–2.2 mm in short-styled flower morphs, 3–4 mm, not recurved, included in long-styled flower morphs. Fruits not seen.

Local name. Modelmon (BisC), according to Alejandro (pers. obs.).

Phenology. *Mussaenda philippica* var. *pubescens* has been collected in flower from March to June, but the time of fruiting is not known.

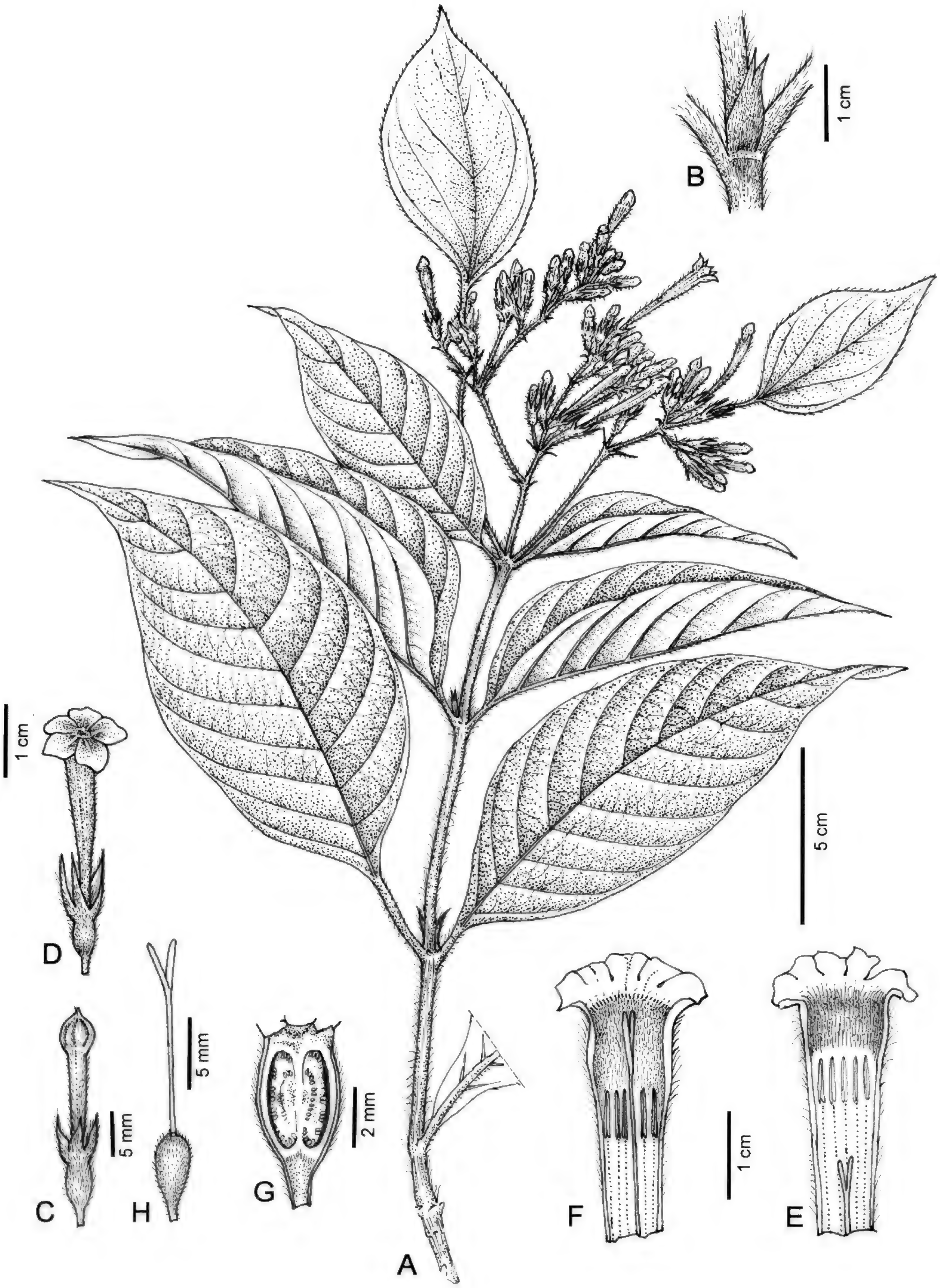

Figure 18. *Mussaenda philippica* A. Rich. var. *pubescens* Alejandro. —A. Flowering branch. —B. Portion of stem with node. —C. Flower bud. —D. Open flower. —E. Short-styled flower morph, corolla tube dissected open in longitudinal section. —F. Long-styled flower morph, corolla tube dissected open in longitudinal section. —G. Longitudinal section through ovary. —H. Calyx, style, and stigma of long-styled flower morph, with the corolla and calyx lobes removed. A–E are taken from the holotype *Ramos & Edaño 49315* (NY); F–H, from *Edaño 21809* (PNH).

Distribution and habitat. *Mussaenda philippica* var. *pubescens* is known from Agusan del Norte, Camiguin, Davao Oriental, and Negros Occidental. The taxon has been collected at edges of secondary forests and on clay soils. Its altitudinal distribution ranges from 400 to 1300 m.s.m.

IUCN Red List category. *Mussaenda philippica* var. *pubescens* is assessed as Endangered or EN C2a(i) by IUCN (2001) criteria. Population size is estimated to number fewer than 2500 mature individuals and a continuing decline is projected, with no subpopulation estimated to contain more than 250 mature individuals. Most areas occupied by this variety are fragmented forests caused by logging or previous mining activities.

Discussion. *Mussaenda philippica* var. *pubescens* differs from the other two *M. philippica* varieties by its conduplicate leaf apices and dense indumentum on both vegetative and reproductive parts. The pubescence is more prominent in the corolla before anthesis, thus the specific epithet.

Paratypes. PHILIPPINES. **Agusan del Norte:** Butuan, San Mateo Bo., Tungao So., 08°48′N, 125°37′E, *Mendoza 42193* (US). **Camiguin:** 09°13′N, 124°41′E, *Ramos 14604* (US). **Davao Oriental:** Mt. Mayo, 07°00′N, 126°19′E, *Edaño 11384* (PNH), Coronon valley near Santa Cruz, 06°52′N, 125°26′E, *A. N. U. 1564* (A). **Negros Occidental:** Mambanig, Mt. Katugasan, 10°44′N, 123°15′E, *Edaño 21782* (L, PNH), *21809* (PNH).

18. Mussaenda philippinensis Merr., Philipp. J. Sci., 3(Pt. C): 264. 1908. TYPE: Philippines. Antique: Semirara Island, July 1905, *E. D. Merrill 4139* (lectotype, designated by Jayaweera [1964: 133], NY [barcode] 00132315!; isolectotypes, K [bc] K000740975 digital image!, US [bc] 000137860 digital image!). Figure 19.

Shrubs 1–6 m tall; young twigs grayish brown, hirsute, the trichomes more than 12-celled, white to brown; older branches with few lenticels, reddish brown, glabrous. Leaf blades elliptic, 9.5–25 × 3.8–10 cm, membranaceous, puberulous above, densely pubescent especially on midrib and veins underneath, margins ciliate, apex acuminate, not conduplicate, base cuneate or long attenuate; secondary veins in 8 to 12 pairs, prominulous above; petioles 0.5–4.2 cm, densely hirsute; stipules triangular to ovate, 6–13 × 3–4.5 mm at the base, deciduous, abaxially with dense indument, adaxially with sparse indument; apex entire or bifid 1/4 of length, stipule lobes slightly diverging or not; colleters numerous, in continuous rows or in groups of 2 at stipule base. Inflorescences terminal, congested, densely hirsute; bracts few, linear to narrowly lanceolate, entire or trilobed, 7–18 × 1–1.2 mm, densely pubescent on both surfaces. Flowers odorless; flower pedicels 2–2.5 mm, with densely appressed or horizontal trichomes; calyx tubes cup-shaped to shortly tubular, 3–4 mm, densely hirsute; calyx lobes linear to narrowly lanceolate, not recurved, 10.5–15 × 1–1.2 mm, pubescent outside, glabrous or pubescent inside, usually cover 3/4 of the corolla bud and ± half of the corolla in open flowers, occasionally with a single calycophyll; colleters in 1 to 3 pairs per lobe, in sinuses between calyx lobes; calycophylls with blades ovate to elliptic, 5-nerved, 5–9 × 3–6.5 cm, white, glabrous or with scattered minute trichomes along nerves of both surfaces, margins ciliate, apex acute, base cuneate, calycophyll stalks 1.5–2.3 cm, densely pubescent; corolla buds densely hirsute, remaining hirsute all over or only on the upper half and with few scattered trichomes below in open flowers (sometimes glabrate); corolla tubes infundibular, swollen part around anthers indistinct, 2–3.2 cm long, yellowish white, without tuft of trichomes surrounding the opening; long-styled flower morphs with sparse, short, striate, ribbon-like trichomes internally to the short filaments from the top; short-styled flower morphs not seen; corolla lobes ovate, 4–7 × 2–5 mm, yellow, abaxially hirsute, adaxially papillate, apex recurved, filiform apical appendages absent; stamens inserted around the middle in long-styled flower morphs; filaments glabrous; anthers linear, 3.5–4 mm in long-styled flower morphs, glabrous or with few scattered trichomes, apex acute; pollen diameters to 14.85 μm, apertures 4; ovary 3–3.5 × 1.7–2 mm, style 19 mm in long-styled flower morphs, stigma 6.5 mm, smooth, not recurved, included in long-styled flower morphs. Fruits subglobose, or ellipsoid, 1–1.5 × 0.7–0.8 cm, smooth, without warts and vertical ridges, green, calyces persistent, densely hirsute; mesocarp 0.3–0.6 mm thick; fruiting pedicels 4–5 mm, densely hirsute; seeds 0.6–0.67 × 0.46–0.6 mm; exotesta cells with 3 to 10 pores on the inner tangential walls, tuberculate thickenings slightly prominent.

Local names. Kambubuyon-dariit (Han), according to Alejandro (pers. obs.).

Phenology. *Mussaenda philippinensis* has been collected in flower from May to July and in fruit during June.

Distribution and habitat. *Mussaenda philippinensis* is known from the provinces of Antique, Apayao, Oriental Mindoro, and Palawan, from islands in the central Philippines. It has been collected in low-altitude secondary forests, on ridges and creekside,

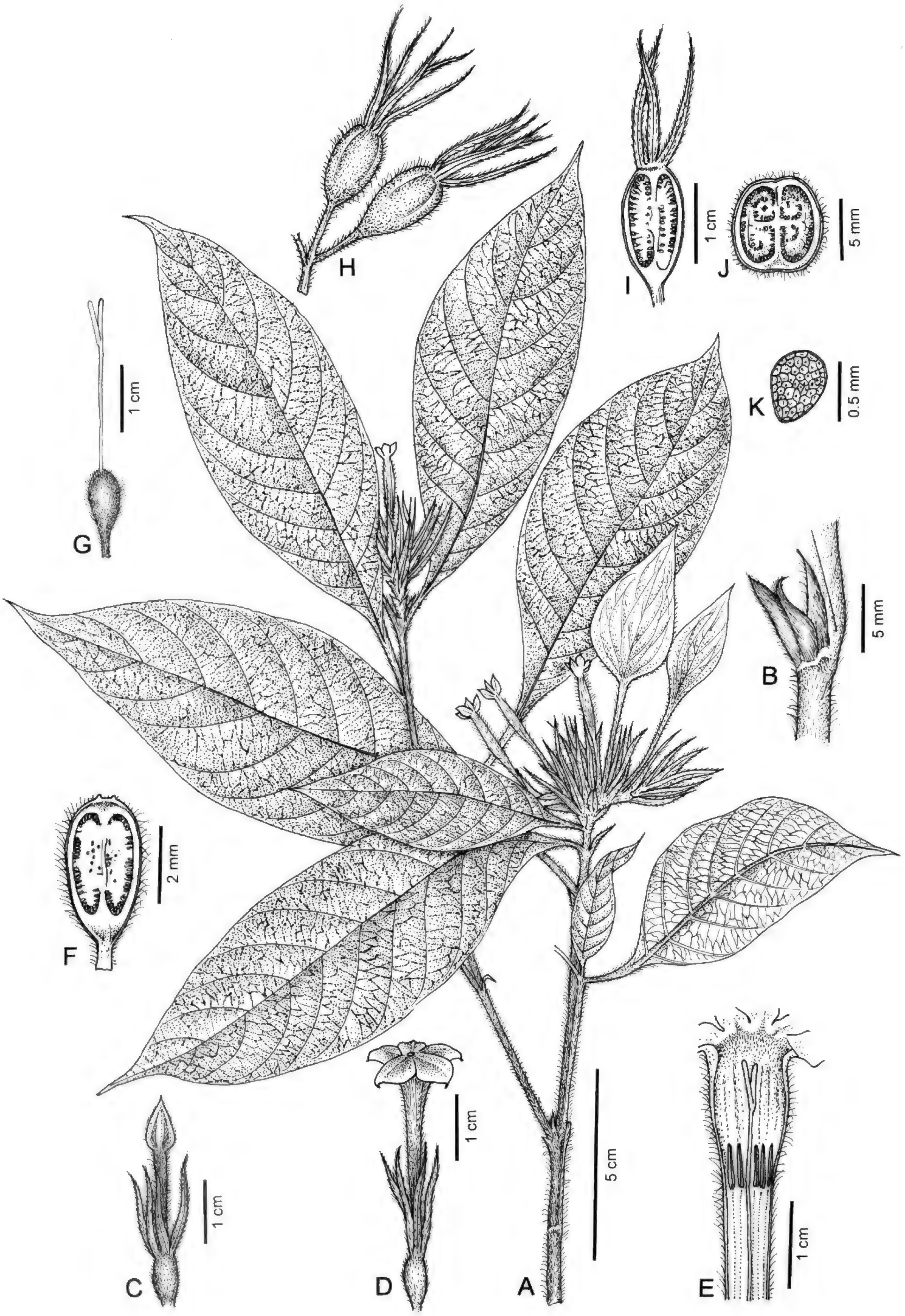

Figure 19. *Mussaenda philippinensis* Merr. —A. Flowering branch. —B. Portion of stem with stipule. —C. Flower bud. —D. Open anthesal flower. —E. Long-styled flower morph, corolla tube dissected open in longitudinal section (short-styled flower morph not seen). —F. Longitudinal section through ovary. —G. Calyx, style, and stigma of long-styled flower, with the corolla and calyx lobes removed. —H. Fruits showing persistent calyces. —I, J. Fruit sections showing seeds on placentas. —K. Seed. A–D are taken from *Sulit & Conklin 17652* (PNH); E–K, from *Edaño 19875* (PNH).

and on clay-loamy soils. Its known altitudinal distribution is from 250 to 300 m.s.m.

Discussion. Merrill referred to only one of his collections in the protologue for *Mussaenda philippensis*, and Jayaweera (1964: 132) accepted this collection (*Merrill 4139*) as type. As a Bureau of Science collection for the flora of the Philippines, one duplicate would have been deposited at PNH and destroyed during World War II. The duplicate at NY was lectotypified by Jayaweera (1964: 133), and additional isolectotypes (K and US) have also been found.

This species is characterized by its long, narrow, persistent calyx lobes, congested inflorescences with long bracts, presence of scattered trichomes on the anthers, and densely hirsute fruits. *Mussaenda philippinensis* is closely similar to *M. wrayi* King of the Malay Peninsula, also recognized by Merrill (1908) and Jayaweera (1964), by its persistent calyces. In the Philippine species, it resembles *M. acuminatissima* rather than *M. magallanensis* as suggested by Jayaweera (1964).

Additional specimens examined. PHILIPPINES. **Apayao:** Luzon Region, Mt. Duraragan, 18°14′N, 122°02′E, *Edaño 19875* (L, PNH). **Mindoro Oriental:** Mansalay, Mt. Yagaw (eastern slope), 12°31′N, 121°26′E, *Ebalo 193* (PNH), *Paniza 9436* (PNH), *Sulit & Conklin 17652* (PNH). **Palawan:** Calamian island group, Culion Island, 11°50′N, 119°58′E, *Bartlett 15545* (PNH).

19. Mussaenda pinatubensis Elmer, Leafl. Philipp. Bot. 9: 3210. 1934. TYPE: Philippines. Pampanga: Luzon Region, Camp Stotsenburg, Mt. Pinatubo, 15°08′N, 120°20′E, May 1927, *A. D. E. Elmer 21978* (holotype, PNH!; isotypes, A [barcode] 00096201 digital image!, G [bc] 00436405 digital image!, GH [bc] 00096200 digital image!, GH [bc] 00096201 digital image!, K [bc] K000740979 digital image!, L [bc] 00057593!, MICH [bc] 1108212 digital image!, MO [bc] 002246678!, NY [bc] 00132316!), P [bc] 02273427 digital image!, US [bc] 000344720 digital image!). Figure 20.

Shrubs or trees, 3–6 m tall; young twigs greenish brown, glabrous; older branches with few to many lenticels, grayish white, glabrous. Leaf blades elliptic, or the young ones orbicular, 3.5–12 × 1.8–4 cm, membranaceous to subcoriaceous, puberulous or with few scattered minute trichomes on both sides, especially on midrib and veins underneath; margins entire, glabrous; apex slenderly acute to acuminate, not conduplicate; base cuneate; secondary veins in 6 to 12 pairs, prominulous above; petioles 0.5–1 cm long, glabrous; stipules triangular or lanceolate, 5–9 × 2–5 mm at the base, deciduous, abaxially with dense indument, adaxially with sparse indument only at the base; apex bifid 1/4 of length, the lobes slightly diverging or not; colleters numerous, in groups of 2 at the base. Inflorescences congested, glabrous; bracts few, linear-lanceolate, entire or bilobed, 5–6 × 1–1.5 mm, densely pubescent underneath, glabrous or puberulous above. Flowers odorless; pedicels 2–3 mm long, with sparsely appressed trichomes; calyx tubes cup-shaped to shortly tubular, 3–3.5 mm long, sparsely pubescent; calyx lobes linear to lanceolate, not recurved, 7–8 × 0.8–1 mm, pubescent outside, glabrous inside, occasionally with a single calycophyll; colleters as 1 or 2 pairs per lobe, in sinuses between calyx lobes; calycophylls ovate or elliptic, 5-nerved, 5–8 × 2.5–6 cm, yellowish white, glabrous or puberulous on the nerves of both sides; margins glabrous or ciliate; apex acuminate; base cuneate; stalks 0.8–1.7 cm long, puberulous; corolla buds densely pubescent, becoming pubescent only on the upper half and with few scattered trichomes below in open flowers; corolla tubes cylindrical, forming a distinctly swollen part around anthers, 2.4–3 cm long, yellowish white or cream, with tuft of trichomes surrounding the opening; short-styled flower morphs with densely long, unstriated, ribbon-like trichomes internally to the base of anthers from the top; long-styled flower morphs with sparsely to densely short, striated, ribbon-like trichomes internally to the base of anthers or to the short filaments from the top; corolla lobes ovate, 4.5–5 × 4.2 mm, yellow to orange, abaxially pubescent, adaxially papillate; apex not recurved, filiform apical appendages 1–2 mm long; stamens inserted to distal 1/4 in short-styled flower morphs, around the middle in long-styled flower morphs; filaments glabrous; anthers linear, 5–5.5 mm long in short-styled flower morphs, 4–4.5 mm long in long-styled flower morphs, glabrous, apex acute; pollen diameter to 16.2 μm, apertures 4; ovary 3–3.5 × 1.5–2 mm; style 4–4.5 mm long in short-styled flower morphs, 15–17 mm long in long-styled flower morphs; stigma 2–2.5 mm long in short-styled flower morphs, 7–7.5 mm long in long-styled flower morphs, smooth, recurved and included in long-styled flower morphs. Fruits globose or ellipsoid, 1–1.5 × 1 cm, with dense warts, without vertical ridges, green, calyces deciduous, glabrous or puberulous; mesocarp 0.5–0.8 mm thick; pedicels 3–4.5 mm long, glabrous; seeds 0.5–0.73 × 0.38–0.6 mm; exotesta cells with 2 to 5 pores on the inner tangential walls, tuberculate thickenings slightly prominent.

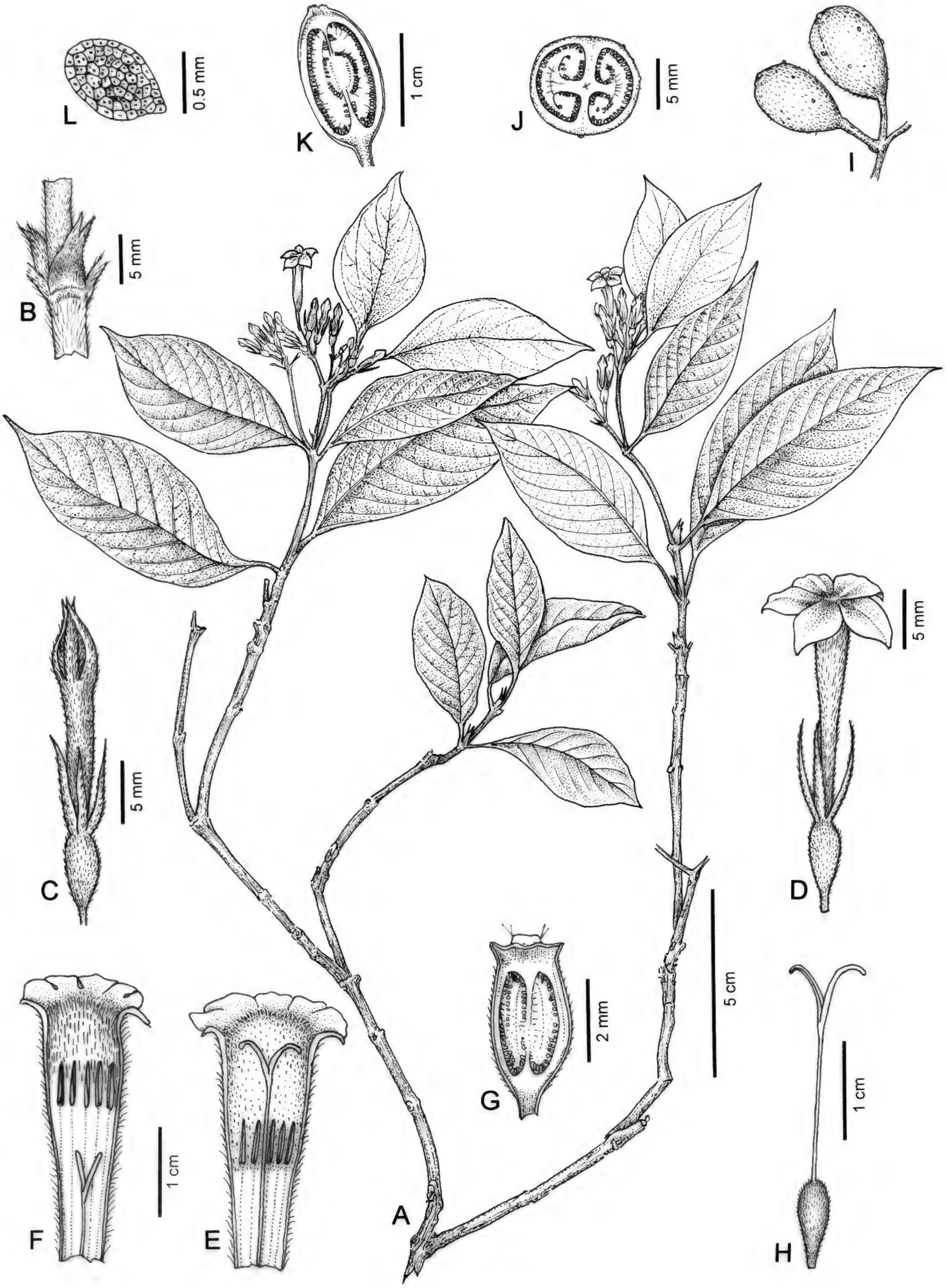

Figure 20. *Mussaenda pinatubensis* Elmer. —A. Flowering branches. —B. Portion of stem with two stipules visible, flanking the node. —C. Flower bud. —D. Open anthesal flower. —E. Short-styled flower morph, corolla tube dissected open in longitudinal section. —F. Long-styled flower morph, corolla tube dissected open in longitudinal section. —G. Longitudinal section through ovary. —H. Calyx, style, and stigma of long-styled flower morph, with the corolla and calyx lobes removed. —I. Two fruits. —J, K. Fruit sections showing seed attachments on placentas, in cross and longitudinal sections, respectively. —L. Seed. A–E are taken from the isotype *Elmer 21978* (NY); F–L, from *Alejandro 1* (*Univ. Santo Tomas Hb.*).

Local name. Kahoy-dalaga (Tag), according to Alejandro (pers. obs.).

Phenology. Mussaenda pinatubensis has been observed to flower from May to June and September to November, and in fruit from October to November.

Distribution and habitat. Mussaenda pinatubensis is endemic to Pampanga and Zambales Provinces of Luzon. The species has been collected in secondary forests, on riversides, on coastal scrubs, on clay or sandy soils, from sites at elevations from 100 to 1070 m.s.m.

Discussion. According to Jayaweera (1964: 135), the holotype for *Mussaenda pinatubensis* escaped the destruction of the PNH herbarium, "apparently having been on loan during World War II." This is the only species of Philippine *Mussaenda* with an existing holotype at PNH.

Mussaenda pinatubensis can be easily recognized by its small and congested leaves on the terminals of branches. It is highly similar to *M. philippica* var. *philippica* in the morphology and nearly glabrous vegetative and reproductive parts. However, *M. pinatubensis* differs distinctly by its longer and narrow calyx lobes to 7–8 × 0.8–1 mm (vs. 1.5–3.5[–5.5] × 1.5–2 mm in *M. philippica* var. *philippica*), and by its smaller leaves to 3.5–12 × 1.8–4 cm (vs. 3.5–23.5 × 2–12 cm in *M. philippica* var. *philippica*).

Additional specimens examined. PHILIPPINES. **Pampanga:** Sapang-bato, 15°33′N, 121°07′E, *Alejandro 1* (L, NY, PNH, *Univ. Santo Tomas Hb.*, US). **Zambales:** Luzon Island, Botolan, near RMTU (Ramon Magsaysay Tech. Univ.), 15°16′N, 120°02′E, 10 Sep. 2002, *Alejandro 98* (PNH, *Univ. Santo Tomas Hb.*), *Merrill 2972* (US).

20. Mussaenda scandens Elmer, Leafl. Philipp. Bot. 3: 992. 1911. TYPE: Philippines. Davao del Sur: Mt. Apo, 07°00′N, 125°16′E, Aug. 1909, *A. D. E. Elmer 11291* (lectotype, first designated by Jayaweera [1964: 135], GH, noting isotypes at A, NY, US; subsequent lectotype [cf. Art. 9.17], designated here, GH [barcode] 00096202 digital image!; isolectotypes, A [bc] 00096204 digital image!, BRIT [bc] 23829 digital image!, CAS [bc] 0007125 digital image!, E [bc] 00502302 digital image!, GH [bc] 00096203 digital image!, K [bc] K000740973 digital image!, L [bc] 00057753!, MO [bc] 000716929 digital image!, NY [bc] 00132317!, P [bc] 02273428 digital image!, U [bc] 0227257 digital image!, US [bc] 000917575!). Figure 21.

Shrubs or scandent shrubs, 3 m tall; young twigs green, glabrous; older branches with few to many lenticels, grayish white, glabrous. Leaf blades ovate to broadly elliptic, 6–14 × 3–8 cm, membranaceous to subcoriaceous, glabrous or puberulous on both sides, especially on midrib and veins underneath; margins glabrous; apex abruptly acute to acuminate, or subcaudate, conduplicate folded; base cuneate to acute; secondary veins in 6 to 10 pairs, prominulous above; petioles 0.3–1.5 cm long, glabrous. Stipules triangular, 7–8 × 3.5–5 mm at the base, deciduous, abaxially with dense indument, adaxially with sparse indument only at the base; apex bifid 1/4 of length, the lobes slightly diverging; colleters numerous, in continuous rows or in groups of 2 at the base. Inflorescences congested, glabrous; bracts few, lanceolate, entire or trilobed, 4–11 × 0.8–1.2 mm, densely pubescent underneath, glabrous or puberulous above. Flowers odorless; pedicels 1–1.5 mm long, with sparsely appressed trichomes; calyx tubes extremely reduced, 1.8–2.5 mm long, puberulous; calyx lobes subulate, not recurved, 3.5–5.5 × 0.8–1 mm, pubescent outside, glabrous inside, occasionally with a single calycophyll; colleters as 1 or 2 pairs per lobe, in sinuses between calyx lobes; calycophylls ovate to elliptic, 5-nerved, 6–7 × 3.8–4.7 cm, yellowish white, glabrous or with scattered minute trichomes on the nerves of both sides; margins glabrous or ciliate; apex acuminate; base cuneate to obtuse; stalks 1.3–2 cm long, puberulous; corolla buds puberulous, becoming glabrous or puberulous only on the upper half in open flowers; corolla tubes cylindrical, forming a distinctly swollen part around anthers, 2–2.5 cm long, yellowish white, without tuft of trichomes surrounding the opening; short-styled flower morphs with sparsely to densely long, unstriated, ribbon-like trichomes internally to the short filaments from the top; long-styled flower morphs with sparsely short, striated, ribbon-like trichomes internally to the base of anthers from the top; corolla lobes ovate, 2.5–4 × 2.5–3 mm, yellow, abaxially puberulous, adaxially papillate; apex not recurved, without filiform apical appendages; stamens inserted to distal 1/4 to ± middle in short-styled flower morphs, around the middle in long-styled flower morphs; filaments with few scattered trichomes; anthers linear, 4–4.5 mm long in short-styled flower morphs, 3.5–4 mm long in long-styled flower morphs, glabrous, apex acute; pollen diameter to 15.75 μm, apertures 4; ovary 1.4–2.3 × 1.4–2 mm; style 3.5–4 mm long in short-styled flower morphs, 13 mm long in long-styled flower morphs; stigma 2–2.5 mm long in short-styled flower morphs, 6 mm long in long-styled flower morphs, smooth, not

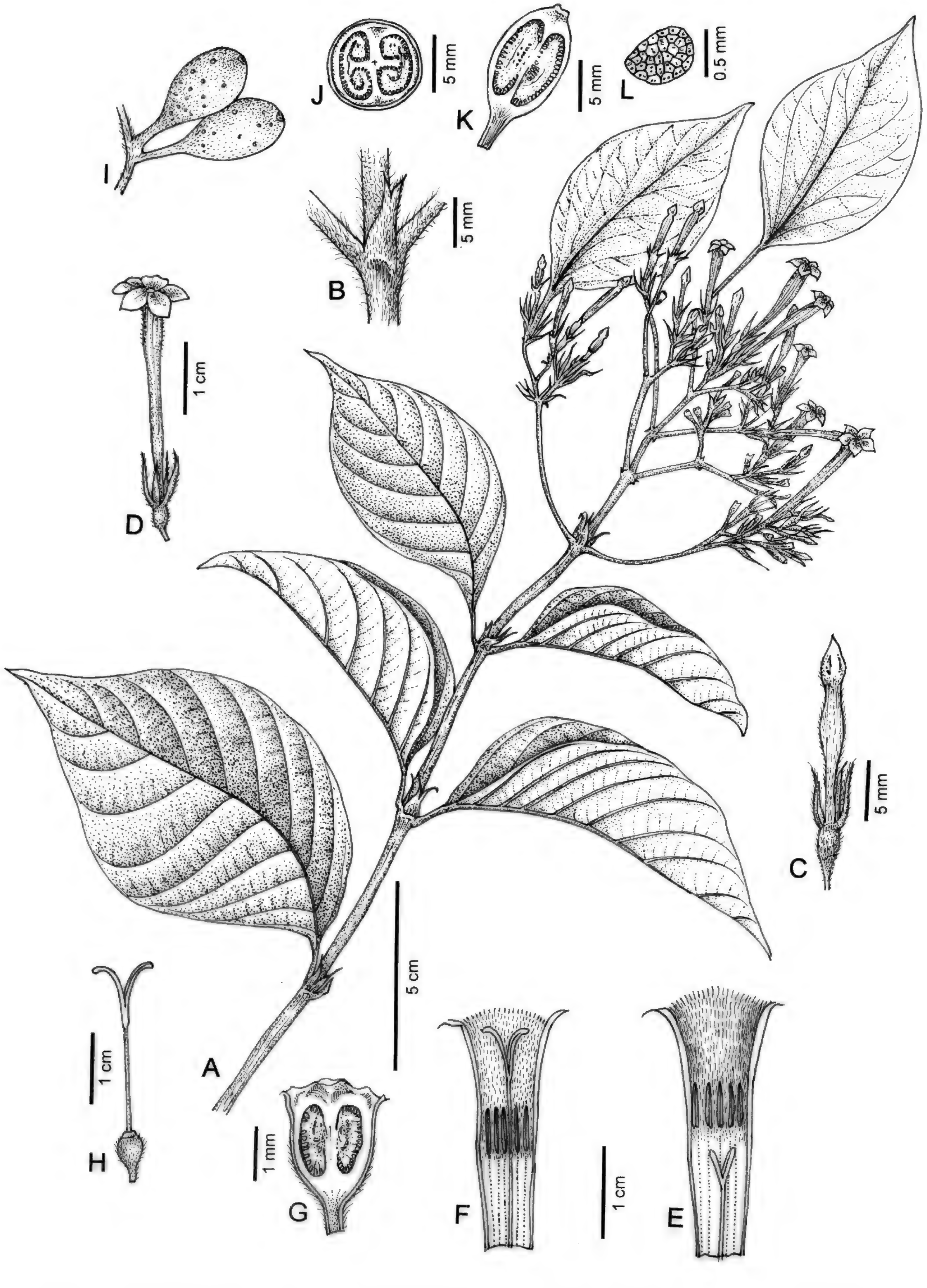

Figure 21. *Mussaenda scandens* Elmer. —A. Flowering branch. —B. Portion of stem with stipule. —C. Flower bud. —D. Open anthesal flower. —E. Short-styled flower morph, corolla tube dissected open in longitudinal section. —F. Long-styled flower morph, corolla tube dissected open in longitudinal section. —G. Longitudinal section through ovary. —H. Calyx, style, and stigma of long-styled flower morph, with the corolla and calyx lobes removed. —I. Two fruits, calyces removed. —J, K. Fruit sections showing seed attachments on placentas, in cross and longitudinal sections, respectively. —L. Seed. A–E are taken from *Santos 4094* (US); F–L, from the isolectotype *Elmer 11291* (L).

recurved and included in long-styled flower morphs. Fruits ellipsoid, 1–1.3 × 0.6–0.7 cm, with sparse warts; without vertical ridges, green, calyces somewhat persistent, glabrous; mesocarp 0.4–0.7 mm thick; pedicels 3–5 mm long, glabrous; seeds 0.83–0.9 × 0.67–0.7 mm; exotesta cells with 3 to 9 pores on the inner tangential walls, without tuberculate thickenings.

Local name. Buay (Bgb), according to Alejandro (pers. obs.).

Phenology. *Mussaenda scandens* has been observed to be flowering from May, August, and December to February, and fruiting in August, October, and March.

Distribution and habitat. *Mussaenda scandens* is restricted to the provinces of Mindanao. This species is collected in mid-altitudes of submontane forests, thickets, streamsides, clay, and humid soils. Its altitudinal distribution ranges from 750 to 850 m.s.m.

Discussion. Jayaweera (1964) designated the lectotype for *Mussaenda scandens* at GH, but there are two duplicates of the original gathering (*Elmer 11291*) at GH. Applying Article 9.17 (McNeill et al., 2012), the GH material is further discriminated in a subsequent or second step lectotypification, with GH (barcode) 00096202 specified as the lectotype and the second GH sheet as an isolectotype. This corresponds with Jayaweera's determination labels on both GH sheets. Additional isolectotypes were found at CAS, E, L, MO, P, and U. For purposes of citation, the more recent author of the second step typification is the one to be cited.

This species is distinct from the rest of Philippine *Mussaenda* species in its climbing habit, grayish white branches at maturity, strongly conduplicate leaves, and greatly reduced calyx tube. *Mussaenda scandens* closely resembles *M. villosa*, also recognized by Jayaweera (1964), found in Thailand, Malaya, Sumatra, and Borneo, primarily due to its habit, vegetative appearance, and glabrous fruits.

Additional specimens examined. PHILIPPINES. **Agusan del Norte:** Butuan, San Mateo Bo., 08°57′N, 125°32′E, *Mendoza 42053* (PNH). **Basilan:** Basilan City, Lamitan Distr., Univ. Philippines Land Grant, 06°39′N, 122°08′E, *Santos 4094* (US); Zambaonga Distr., Mt. Tubuan, 07°03′N, 124°02′E, *Ramos & Edaño 36596* (L). **Bukidnon:** Mindagat, 08°32′N, 124°56′E, *Pelzer 13555* (PNH). **Davao del Sur:** Todaya Distr., Mt. Apo, 07°00′N, 125°16′E, *Alejandro 92* (L, NY, UBT, *Univ. Santo Tomas Hb.*), Davao, *Copeland 355* (NY, US). **Surigao del Sur:** Mindanao Region, *Wenzel 3354* (BR, MO, NY). **Zamboanga Sibugay:** Malangas, *Ramos & Edaño 37307* (A).

21. Mussaenda setosa Merr., Philipp. J. Sci., 10(Pt. C): 104. 1915. TYPE: Philippines. Palawan: Malampaya Bay, Mt. Capoas, 10°50′N, 119°13′E, 21 Apr. 1913, *E. D. Merrill 9496* (lectotype, designated by Jayaweera [1964: 137], US [barcode] 000901285!; isolectotypes, K [bc] K000740972 digital image!, L!, MO [bc] 000934292!, P [bc] 02273429 digital image!). Figure 22.

Shrubs or trees, 2–4 m tall; young twigs green, hirsute, the trichomes more than 12-celled, white to brown; older branches lenticellate, grayish brown, glabrous or with few scattered trichomes. Leaf blades elliptic to ovate, 12–29.8 × 6–13 cm, membranaceous, setose on both sides especially on midrib and veins underneath, margins ciliate, apex acuminate or subcaudate, not conduplicate, base cuneate or long attenuate; secondary veins in 15 to 18 pairs, prominulous above; petioles 0.5–3.5 cm, hirsute; stipules triangular or ovate, 6–11 × 4–6.5 mm at the base, persistent or deciduous, abaxially with dense indument, adaxially with dense indument only at the base, apex bifid ± half to 3/4 of length, stipule lobes slightly diverging or not; colleters numerous, in continuous rows or in groups of 2 at the base. Inflorescences spreading, hirsute; bracts few, lanceolate, entire or trilobed, 3.5–9 × 1–2 mm, densely hirsute on both sides; flower pedicels 0.5–1 mm, glabrous or with few scattered trichomes. Flowers odorless; calyx tubes cup-shaped to shortly tubular, 3–3.5 mm, densely hirsute; calyx lobes subulate, not recurved, 4–6 × 1 mm, hirsute outside, glabrous inside, occasionally with a single calycophyll; colleters as 1 or 2 pairs per lobe, in sinuses between calyx lobes; calycophylls ovate to orbicular, 5-nerved, 5.5–7 × 4–5.2 cm, white, sparsely pubescent along nerves of both surfaces, margins ciliate, apex acuminate, base obtuse; stalks 0.8–1.6 cm, densely hirsute; corolla buds densely hirsute, becoming sparsely hirsute only on the upper half in open flowers; corolla tubes cylindrical, forming a distinctly swollen part around anthers, 3–4 cm, yellowish or greenish white, with tuft of trichomes surrounding the opening; short-styled flower morphs with dense, long, unstriated, ribbon-like trichomes internally to the base of anthers from the top; long-styled flower morphs with sparsely globular, striate trichomes internally to the short filaments from the top; corolla lobes ovate, 4–6 × 3.5–5 mm, yellow or yellow-orange, abaxially hirsute, adaxially papillate; apex recurved, filiform apical appendages 1–1.5 mm long; stamens inserted to distal 1/4 in short-styled flower morphs, to basal 1/4 or around

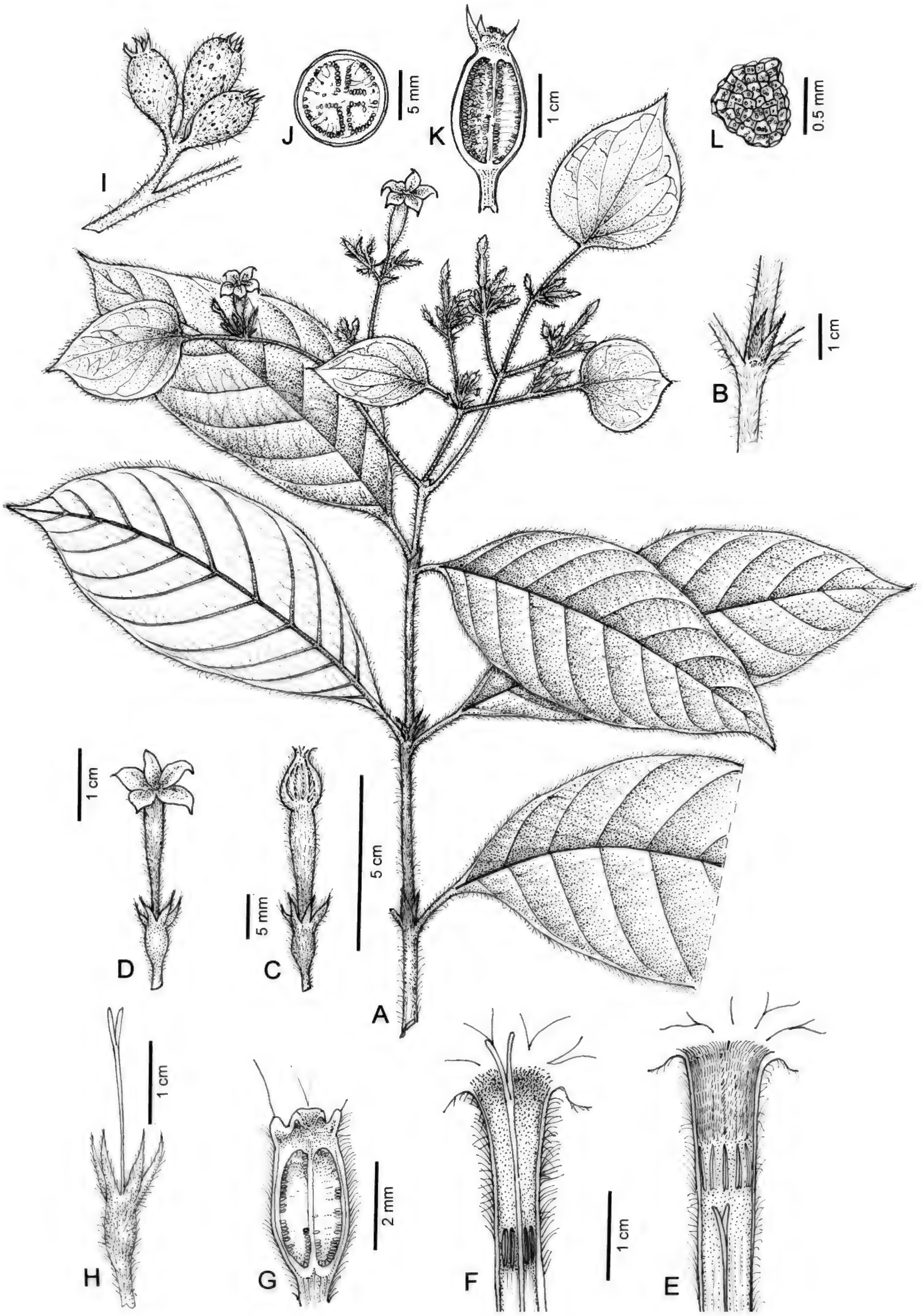

Figure 22. *Mussaenda setosa* Merr. —A. Flowering branch. —B. Portion of stem with stipule. —C. Flower bud. —D. Open anthesal flower. —E. Short-styled flower morph, corolla tube dissected open in section. —F. Long-styled flower morph, corolla tube dissected open in longitudinal section. —G. Longitudinal section through ovary. —H. Calyx, style, and stigma of long-styled flower. —I. Portion of fertile axes with three fruits. —J, K. Fruit sections showing seed attachments on placentas, in cross and longitudinal sections, respectively. —L. Seed. A–D, F–L are taken from *Alejandro 86* (*Univ. Santo Tomas Hb.*); E, from *Alejandro 87* (UBT).

the middle in long-styled flower morphs; filaments glabrous; anthers linear, 5–5.5 mm long in short-styled flower morphs, 3.5–4 mm long in long-styled flower morphs, glabrous, apex acute; pollen diameter to 15.3 μm, apertures 4, rarely 3; ovary 2.5–3.5 × 2–2.5 mm; style 7–8 mm long in short-styled flower morphs, 19–22 mm long in long-styled flower morphs; stigma 3–3.5 mm long in short-styled flower morphs, 6–7 mm long in long-styled flower morphs, papillose, not recurved and included in long-styled flower morphs. Fruits subglobose, 1.3–1.6 × 0.8–1 cm, with sparse to dense warts, vertical ridges slightly prominent, green, calyces persistent, sparsely hirsute; mesocarp 0.8–1 mm thick; pedicels 5–6 mm long, densely hirsute; seeds 0.57–0.78 × 0.38–0.85 mm, exotesta cells with 2 to 5 pores on the inner tangential walls, tuberculate thickenings absent.

Local name. Sigidago (Tbw), according to Alejandro (pers. obs.).

Phenology. Mussaenda setosa has been observed to flower from April, and October to December, and in fruit from April, and November to December.

Distribution and habitat. Mussaenda setosa is endemic to Palawan, found in low-altitude secondary forests, or dipterocarp forests, on clay-loamy soils, and at altitudes ranging from 40 to 700 m.s.m.

Discussion. Only one collection (*Merrill 9496*) was cited by Merrill in the 1915 protologue for *Mussaenda setosa*. The destruction of the PNH herbarium during World War II and the PNH type prompted Jayaweera (1964: 137) to lectotypify an isotype at US. Since then, other duplicates have been found at K, L, MO, and P by the authors.

Mussaenda setosa is characterized by its long, slender, greenish white, strictly hirsute on the upper half, entirely glabrous in the lower half corolla tubes after anthesis. It is the only species observed wherein the stamens extend to the basal one fourth of the corolla in long-styled flower morphs. Jayaweera (1964) saw only one specimen of this species, which is the lectotype (long-styled flower morph). He suggested that *M. setosa* is similar to *M. palawanensis*, which are both endemic to Palawan. Recent collections of *M. setosa* (including the short-styled flower morphs) revealed more distinct characters that are completely divergent from *M. palawanensis*. Based on vegetative characters, *M. setosa* is rather similar to *M. albiflora* in its densely hirsute young twigs, in the length and indumentum of leaf petioles and stipules, and more obviously in the size, shape, texture, and indumentum of the leaves. However, they differ in flower morphology including the color of the corolla lobes. *Mussaenda setosa* and *M. liedeae*, both endemic to Palawan, are the only Philippine species with all or only globular trichomes inside the corolla tube of long-styled flower morphs.

Additional specimens examined. PHILIPPINES. **Palawan:** Taytay, Ibangley, 10°20′N, 119°20′E, *Alejandro 86* (L, UBT, *Univ. Santo Tomas Hb.*), *87* (NY, PNH, UBT, US); Ibangley Brookside Hill, Pagdanan Range, 10°45′N, 119°33′E, *Ridsdale 156781* (L, PNH).

22. **Mussaenda ustii** Alejandro, Bot. J. Linn. Soc. 158: 88–90, fig. 1. 2008. TYPE: Philippines. Aklan: Panay Island, Nabas, Mt. Laserna, 11°49′N, 122°05′E, 28 Oct. 2002, *G. J. D. Alejandro & J. C Castro 28* (holotype, L!; isotypes, UBT! [barcode] 0002959, *Univ. Santo Tomas Hb.*!).

Shrubs or small trees, 2–6 m tall; young twigs green, sparsely to densely hirsute, the trichomes more than 12-celled, white to brown; older branches with few to many lenticels, reddish or grayish brown, glabrous or with few scattered trichomes. Leaf blades elliptic or ovate-elliptic, or rarely obovate, 7–20 × 4–8 cm, membranaceous, sparsely pubescent above, sparsely or densely pubescent, especially on midrib and veins underneath; margins ciliate; apex acuminate or subcaudate, not conduplicate; base cuneate, or long attenuate; secondary veins in 9 to 12 pairs, prominulous above; petioles 0.4–1.5 cm long, densely hirsute. Stipules ovate to triangular, 7–11 × 5–8 mm at the base, persistent or deciduous, abaxially with dense indument, adaxially with sparse indument only at the base; apex bifid ± half of length, the lobes slightly diverging or not; colleters numerous, in groups of 2 at the base. Inflorescences spreading or congested, sparsely or densely hirsute; bracts numerous, lanceolate, entire or trilobed, 4–9 × 1–3 mm, densely pubescent underneath, glabrous above. Flowers odorless; pedicels 2–7 mm, with sparsely appressed trichomes; calyx tubes cup-shaped to shortly tubular, 3–4 mm, sparsely or densely hirsute; calyx lobes lanceolate or subulate, not recurved, 3.5–8 × 1–1.5 mm, hirsute outside, glabrous inside, occasionally with a single calycophyll; colleters as 1 or 2 pairs per lobe, in sinuses between calyx lobes; calycophylls elliptic or ovate, 5-nerved, 6–12.5 × 4–7.5 cm, white, sparsely pubescent on the nerves of both sides, margins ciliate, apex acuminate, base cuneate or attenuate, stalks 1–2.5 cm, densely hirsute; corolla buds pilose or rarely hirsute, remaining pilose all over or becoming pilose only on the upper half and with few scattered trichomes below in open flowers; corolla tubes cylindrical, forming a distinctly swollen part around anthers, 2.5–3.8 cm, cream or yellowish white, with tuft of trichomes surrounding the opening; short-styled flower morphs with densely long, unstriated, ribbon-like trichomes to base of anthers from the top; long-styled flower morphs with dense, short, striated, ribbon-like trichomes to the short filaments from the top; corolla lobes lanceolate to ovate, 7–13 × 3–6 mm, recurved, yellow with white margins, abaxially pilose, adaxially papillate; apex not recurved, with 1-mm filiform apical appendages; stamens inserted to the distal 1/4 in short-styled flower morphs, around middle in long-styled flower morphs, filaments glabrous, anthers linear, 4.5–6 mm in short-styled flower morphs, 4–4.5 mm in long-styled flower morphs, glabrous, apex acute; pollen diameter to 16 µm, apertures 4, rarely 3; ovary 3–4 × 1.5–2.5 mm, style 3–5 mm in short-styled flower morphs, 18–20 mm in long-styled flower morphs, stigma smooth, 1.5–2.5 mm in short-styled flower morphs, 6–8 mm in long-styled flower morphs, recurved, semi-exserted to distinctly exserted in long-styled flower morphs. Fruits globose or ellipsoid, 1–2.4 × 1–1.1 cm, with dense warts, without vertical ridges, green, calyces deciduous, glabrous or sparsely pubescent; mesocarp 0.8–1 mm thick; pedicels 3–6 mm, sparsely pubescent; seeds 0.4–0.75 × 0.35–0.65 mm; exotesta cells with 3 to 8 pores on the inner tangential walls, tuberculate thickenings slightly prominent.

Local names. Agboy (BisPn); Buyon (Bis) according to Alejandro (pers. obs.).

Phenology. Mussaenda ustii has been observed to flower from September to February, and fruit from October to December.

Distribution and habitat. Mussaenda ustii is endemic to Panay Island and is known from low-altitude humid evergreen forests, on stream banks, on roadsides, in open areas, or in partly shaded sites, occasionally growing with ferns or with *Imperata cylindrica* (L.) P. Beauv. (Poaceae), on clay-loam soils. It has been collected at altitudes ranging from 50 to 450 m.s.m.

Discussion. This species is easily distinguished by its long flower pedicels to 7 mm, by the yellow corolla lobes with white margins (forming a star pattern), and by the recurved and exserted stigma lobes in long-styled flower morphs. *Mussaenda ustii* resembles *M. anisophylla* and *M. albiflora* in the morphology and indumentum of vegetative parts but totally differs in its reproductive morphology.

Additional specimens examined. PHILIPPINES. **Aklan:** Panay, Nabas, Mt. Laserna, 11°49′N, 122°05′E, *Alejandro 26* (NY), *27* (*Univ. Santo Tomas Hb.*), *32* (UBT, US), *40* (PNH, *Univ. Santo Tomas Hb.*); Ibajay, Brgy. Tagbaya, Mt. Bubog, 11°49′N, 122°09′E, *Alejandro 38* (NY), *39* (*Univ. Santo Tomas Hb.*, WAG); Buruanga, Brgy. Tigum, Mt. Mangamura, 11°50′N, 121°53′E, *Alejandro 44* (L, UBT), *47* (*Univ. Santo Tomas Hb.*), *48* (BR, *Univ. Santo Tomas Hb.*), *52* (PNH, *Univ. Santo Tomas Hb.*), *53* (BR), *54* (*Univ. Santo Tomas Hb.*, US), *56* (NY, US, WAG).

23. Mussaenda vidalii Elmer, Leafl. Philipp. Bot. 3: 993–994. 1911. TYPE: Philippines. Davao del Sur: Todaya, Mt. Apo, 07°00′N, 125°16′E, Aug. 1909, *A. D. E. Elmer 11309* (lectotype, first designated by Jayaweera [1964: 139], GH, noting isotypes at A, NY, US; subsequent lectotype [cf. Art. 9.17], designated here, GH [barcode] 00096205 digital image!; isolectotypes, A [bc] 00096207!, E [bc] 00502301 digital image!, GH [bc] 00096206 digital image!, K [bc] K000740971 digital image!, MO [bc] 000716930 digital image!, NY [bc] 00132318!, U [bc] 0227259 digital image!, US [bc] 000917576!). Figure 23.

Shrubs or scandent shrubs, 3–5 m tall; young twigs green, sparsely to densely hirsute, the trichomes more than 12-celled, brown; older branches with few lenticels, grayish brown, glabrous or with few scattered trichomes. Leaf blades ovate, or ovate-elliptic, 9–27 × 4.3–15.2 cm, membranaceous to subcoriaceous, sparsely to densely hirsute on both sides, especially on midrib and veins underneath; margins ciliate; apex acute to acuminate, not conduplicate; base broadly obtuse, or cuneate; secondary veins in 6 to 11 pairs, prominulous above; petioles 1.5–5 cm long, densely hirsute. Stipules triangular, 5–10.5 × 5.5–9 mm at the base, persistent or deciduous, abaxially hirsute, adaxially sparsely hirsute only at the base and apex; apex bifid 1/4 to ± half of length, the lobes slightly diverging; colleters few to numerous, in continuous rows or in groups of 2 at the base. Inflorescences spreading or congested, sparsely to densely hirsute, bracts few, linear-lanceolate, entire or trilobed, 3–16 × 1.5–3 mm, densely pubescent underneath, glabrous or sparsely pubescent above. Flowers odorless; pedicels 1–1.5 mm long, with densely appressed trichomes; calyx tubes cup-shaped to shortly tubular, 3–4 mm long, densely hirsute; calyx lobes lanceolate to ovate, not recurved, 4–10 × 1–3 mm, pubescent on both sides, occasionally with a single calycophyll; colleters as 2 to 4 pairs per lobe, in sinuses between calyx lobes; calycophylls broadly ovate, 5-nerved, 5–10 × 2.5–8.5 cm, white, sparsely pubescent on the nerves of both sides; margins ciliate; apex acuminate; base cuneate to obtuse; stalks 1.4–2 cm long, densely hirsute; corolla buds densely hirsute, remaining hirsute all over or only on the upper half and with few scattered trichomes below in open flowers; corolla tubes infundibular, swollen part around anthers indistinct, 2.2–3 cm long, yellowish green, without tuft of trichomes surrounding the opening; short-styled flower morphs with densely long, unstriated, ribbon-like trichomes internally to the base of anthers from the top; long-styled flower morphs with sparsely short, striated, ribbon-like trichomes internally to the short filaments from the top; corolla lobes orbicular or broadly elliptic, 4–5 × 4–6 mm, orange to yellow, abaxially hirsute, adaxially papillate; apex not recurved, without filiform apical appendages. Stamens inserted to distal 1/4 in short-styled flower morphs, distal 1/4 to around the middle in long-styled flower morphs; filaments glabrous; anthers linear, 5–6.2 mm long in short-styled flower morphs, 4–4.5 mm long in long-styled flower morphs, glabrous, apex acute; pollen diameter to 16.65 μm, apertures 4; ovary 3.5–5.5 × 1.5–2 mm; style 2.5 mm long in short-styled flower morphs, 17–25 mm long in long-styled flower morphs; stigma 2–2.5 mm long in short-styled flower morphs, 6–8 mm long in long-styled flower morphs, smooth, not recurved and included or semi-exserted in long-styled flower morphs. Fruits ellipsoid, 1.5–2.2 × 1–1.4 cm, with sparse to dense warts, without vertical ridges, green, calyces ± persistent, densely hirsute; mesocarp 0.5–0.8 mm thick; pedicels 4–6 mm long, densely hirsute; seeds 0.53–0.73 × 0.4–75 mm; exotesta cells with 3 to 8 pores on the inner tangential walls, tuberculate thickenings slightly prominent.

Local names. Agat (Ifg); Ananayop, Anan-yop (BisSL); Botay (Bgb); Bukang-bukang (Bkd); Buyon (Bis); Salomayag (Mbo), according to Alejandro (pers. obs).

Phenology. Mussaenda vidalii was observed to flower from February to August, and fruit in March to May.

Distribution and habitat. Mussaenda vidalii has been collected in the provinces of Ifugao (Luzon), Biliran and Samar (Visayas), and mostly in Agusan del Note, Bukidnon, Davao del Sur, and Lanao del Sur (Mindanao). This species is known from low- to high-altitude secondary forests, on coastal scrubs, on stream banks, on clay or sandy soils, at altitudes from 100 to 2000 m.s.m.

Discussion. Jayaweera (1964) designated a lectotype for *Mussaenda vidalii* at GH, but there are two duplicates of the original gathering (*Elmer 11309*) at GH. Applying Article 9.17 (McNeill et al., 2012), the GH material is further discriminated in subsequent or second step lectotypification, with GH (barcode) 00096205 specified as the lectotype and the second GH sheet as isolectotype. This corresponds with Jayaweera's determination labels on the two GH sheets. Additional isolectotypes were found at E, K, MO, and U. For purposes of citation, the more recent author of the second step typification is the one to be cited.

The type specimen of *Mussaenda vidalii* was described as a scandent shrub, but most of the herbarium collections for this species represent erect shrubs or small trees. *Mussaenda vidalii* is remarkable for its densely ferruginous vegetative and reproductive parts, by its large leaf blades to 9–27 × 4.3–15.2 cm, broadly ovate to elliptic in shape, by the petioles to 1.5–5 cm, by the stipules broad-based, adaxially hirsute only at the base and apex, by the calyx lobes ovate, broader than the long corolla lobes to 4–5 × 5–6 cm, and by the large fruits that are densely hirsute fruits. Variability within *M. vidalii* is restricted to the habit, bract sizes, and by the size and shape of sepals, petals, and fruits. *Mussaenda anisophylla* is obviously the nearest relative of *M. vidalii* due to its densely hirsute corolla buds, by the length of petioles to 1.5–5 cm, by the length of corolla tubes to 3 cm, and with a maximum diameter of pollen to 16.65 μm, also the maximum diameter for pollen in *M. vidalii*. The two species differ in the shape of calyx lobes, and shape and indumentum of stipules. *Mussaenda vidalii* has lanceolate or ovate calyx lobes that are triangular and adaxially hirsute only at the base and apex of stipules, whereas *M. anisophylla* is characterized by linear calyx lobes that are ovate and adaxially with even coverage of the hirsute indument of the stipules.

Additional specimens examined. PHILIPPINES. **Agusan del Norte:** Tungao, logging camp, 08°47′N, 125°35′E, *Caballes 98444* (PNH), *Mabesa & Escasino 98452* (PNH); Butuan, Tungao So., San Mateo Bo., 08°57′N, 125°34′E, *Mendoza 42076* (PNH), *42373* (PNH); Asiga river,

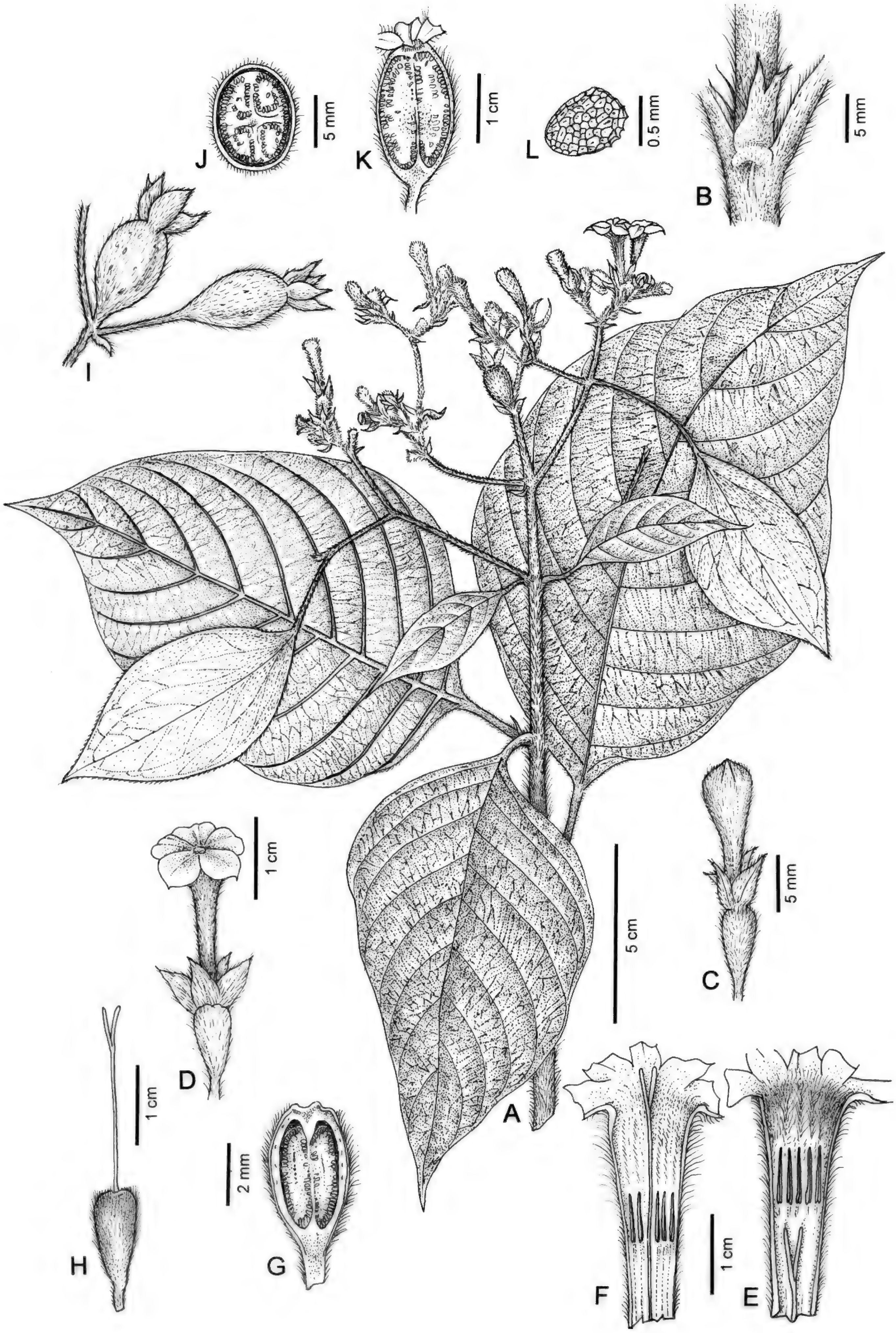

Figure 23. *Mussaenda vidalii* Elmer. —A. Flowering branch, with one fruit evident at center. —B. Portion of stem with stipule. —C. Flower bud. —D. Open anthesal flower. —E. Short-styled flower morph, corolla tube dissected open in longitudinal section. —F. Long-styled flower morph, corolla tube dissected open in longitudinal section. —G. Longitudinal section through ovary. —H. Calyx, style, and stigma of long-styled flower morph, with the corolla and calyx lobes removed. —I. Two fruits. J–K. Fruit sections showing seed attachments on placentas, in cross and longitudinal sections, respectively. —L. Seed. A–D, F–H are taken from *Sulit 14366* (PNH); E, from *Sulit 21530* (PNH); I–L, from *Edaño 11926* (L).

09°26′N, 125°54′E, *Ramos & Convocar 83671* (A). **Biliran:** Biliran Island, Mt. Suiro, N slope, 11°30′N, 124°29′E, *Sulit 21530* (PNH). **Bukidnon:** Pintaoranan, 08°08′N, 125°00′E, *Anonuevo 13516* (A, PNH); Damulog, Tangculan & vic., 07°48′N, 124°54′E, *Ramos & Edaño 39050* (A). **Davao del Sur:** Mindanao region, Todaya, Mt. Apo, 07°00′N, 125°16′E, *Clemens 15729* (NY). **Ifugao:** Banaue, Bayninan, 17°10′N, 120°45′E, *Conklin & Buwaya 79609* (A, PNH). **Lanao del Sur:** Dansalan vic. (now Marawi City), 08°00′N, 124°18′E, *Zwickey 519* (A). **Leyte:** Ormoc, Lake Danao, 11°00′N, 124°36′E, *Edaño 11926* (L, PNH), Antilao River, 11°02′N, 124°32′E, *Edaño 11873* (L, PNH), *Wenzel 667* (A, MO). **Samar:** Catubig River, 12°23′N, 125°03′E, *Ramos 24485* (A, US); Loquilocon Wright, 11°47′N, 125°06′E, *Sulit 6098* (A, PNH); Concord, Bagacay, 11°35′N, 124°49′E, *Sulit 6280* (PNH); Catarman, Lope de Vega, Mt. Cansayao, 12°29′N, 124°37′E, *Sulit 14366* (A, PNH, US).

24. Mussaenda viridiflora Alejandro, Bot. J. Linn. Soc. 158: 90–91, fig. 2. 2008. TYPE: Philippines. Aklan: Panay Island, Buruanga, Brgy. Tigum, Mt. Mangamura, 11°50′N, 121°53′E, 30 Oct. 2002, *G. J. D. Alejandro & J. C. Castro 49* (holotype, *Univ. Santo Tomas Hb.*!; isotype, L!).

Shrubs, 1.5–2 m tall; young twigs green, sparsely hirsute, the trichomes more than 12-celled, brown; older branches with few to many lenticels, reddish brown, glabrous or with few scattered trichomes. Leaf blades elliptic, 9.5–19.5 × 4.2–7.3 cm, membranaceous, sparsely pubescent, especially on the midrib and veins of both sides; margins ciliate; apex acuminate, or subcaudate, not conduplicate; base cuneate or attenuate; secondary veins in 8 to 12 pairs, prominulous above; petioles 0.4–3 cm long, sparsely to densely hirsute. Stipules ovate to triangular, 8–10 × 5–7 mm at the base, deciduous, with dense indument on both sides; apex bifid ± half of length, the lobes not diverging; colleters numerous, in groups of 2 at the base. Inflorescences spreading or congested, sparsely hirsute; bracts few, lanceolate, entire or trilobed, 3–8 × 2–3.5 mm, densely pubescent underneath, sparsely pubescent above. Flowers sweet-scented; pedicels 1–1.5 mm long, with sparsely appressed trichomes; calyx tubes cup-shaped to shortly tubular, 3–3.5 mm long, puberulous; calyx lobes lanceolate or subulate, strongly recurved, 3–4 × 1–1.5 mm, pubescent on both sides, occasionally with a single calycophyll; colleters as 1 pair per lobe (sometimes absent), in sinuses between calyx lobes; calycophylls ovate, 5-nerved, 7.9–9 × 4–5 cm, white, glabrous or puberulous on the nerves of both sides; margins ciliate; apex acuminate; base obtuse; stalks 2.3–2.8 cm long, densely pubescent; corolla buds densely pubescent, becoming sparsely pubescent in open flowers; corolla tubes cylindrical, forming a distinctly swollen part around anthers, 3–3.5 cm long, greenish white, with tuft of trichomes surrounding the opening; short-styled flower morphs with densely long, unstriated, ribbon-like trichomes to the base of anthers from the top; long-styled flower morphs not seen; corolla lobes ovate, 8–10 × 3–4 mm, white, green-tinged at the median ridges and bases, abaxially pubescent, adaxially papillate; apex recurved, with 1.5–2 mm long filiform apical appendages. Stamens inserted to distal 1/4 in short-styled flower morphs; filaments glabrous; anthers linear, 5–5.5 mm long in short-styled flower morphs, glabrous, apex acute; pollen diameter to 15.75 μm, apertures 4; ovary 3–4 × 1.5–2 mm; style 3.5–4 mm long in short-styled flower morphs; stigma smooth, 2–2.5 mm long in short-styled flower morphs. Fruits not seen.

Local name. Agboy (BisPn); Buyon (Bis), according to Alejandro (pers. obs.).

Phenology. *Mussaenda viridiflora* has been collected in flower from October to November, and is probably fruiting in January to March.

Distribution and habitat. *Mussaenda viridiflora* is endemic to Panay Island. It has been collected at lower altitudes of Mount Mangamura, near the road going to Ignito Cave, on open areas with rich herb layers, on clay-loam soils, and at altitudes of 300 m.s.m.

Discussion. This species is only known from the type collection. *Mussaenda viridiflora* is characterized by its sweet-scented flowers, white and green-tinged at the base, by the median ridges of corolla lobes, and by its strongly reflexed calyx lobes similar to the African *M. arcuata*, which is a feature not observed in other Philippine *Mussaenda* species. *Mussaenda viridiflora* resembles *M. albiflora* in its vegetative parts and white corolla lobes. However, *M. viridiflora* has less indumentum on vegetative structures, and its white corolla lobes are green-tinged on the median ridges and lobe bases. Based on reproductive morphology, *M. viridiflora* is more similar to *M. philippica* var. *philippica* and *M. pinatubensis* due to the shape of corolla lobes and indumentum of flowers.

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Appendix 1. List of *Mussaenda* species and varieties included in this study. Numbers indicate their position within the taxonomic treatment.

1. *Mussaenda acuminatissima* Merr.
2. *Mussaenda albiflora* Merr.
3. *Mussaenda anisophylla* S. Vidal
4. *Mussaenda attenuifolia* Elmer
5. *Mussaenda benguetensis* Elmer
6. *Mussaenda chlorantha* Merr.
7. *Mussaenda grandibracteata* Alejandro
8. *Mussaenda grandifolia* Elmer
9. *Mussaenda lanata* C. B. Rob.
10. *Mussaenda liedeae* Alejandro
11. *Mussaenda macrophylla* Wall.

11a. *Mussaenda macrophylla* var. *brevipilosa* Jayaw.
11b. *Mussaenda macrophylla* var. *grandisepala* (Jayaw.) Alejandro
11c. *Mussaenda macrophylla* Wall. var. *macrophylla*
12. *Mussaenda magallanensis* Elmer
13. *Mussaenda milleri* Elmer ex Alejandro
14. *Mussaenda multibracteata* Merr.
15. *Mussaenda nervosa* Elmer
16. *Mussaenda palawanensis* Merr.
17. *Mussaenda philippica* A. Rich.
17a. *Mussaenda philippica* var. *aurorae* Sulit
17b. *Mussaenda philippica* A. Rich var. *philippica*
17c. *Mussaenda philippica* var. *pubescens* Alejandro
18. *Mussaenda philippinensis* Merr.
19. *Mussaenda pinatubensis* Elmer
20. *Mussaenda scandens* Elmer
21. *Mussaenda setosa* Merr.
22. *Mussaenda ustii* Alejandro
23. *Mussaenda vidalii* Elmer
24. *Mussaenda viridiflora* Alejandro

Appendix 2. Index to numbered collections. Examined specimens are listed alphabetically according to the principal collector, followed by the collection number. The numbers in parentheses correspond to the number of species and varieties in Appendix 1 and in the taxonomic treatments. Asterisks indicate type collections. This index includes all specimens examined by the authors, not only those mentioned in the taxonomic treatments.

Adduru, M. 218 (17b); *Ahern, G. P. 339* (17b), *818* (17b); *Alcasid & Oane 39863* (17b); *Alejandro, G. J. D. 1* (19), *3* (12), *4* (17b), *5* (12), *7* (17b), *8* (17b), *9* (17a), *10* (17b), *11* (17b), *12* (17b), *13* (7), *15* (7), *16* (7), *17* (7), *19* (17b), *20* (2), *21* (17b), *22* (17b), *23* (17b), *24* (17b), *25* (17b), *26* (22), *27* (22), *29* (2), *30* (2), *31* (2), *32* (22), *33* (17b), *34* (17b), *35* (17b), *36* (2), *37* (2), *38* (22), *39* (22), *40* (22), *41* (17b), *43* (2), *44* (22), *45* (17b), *46* (2), *47* (22), *48* (22), *50* (2), *51* (2), *52* (22), *53* (22), *54* (22), *55* (17b), *56* (22), *57* (17b), *58* (17b), *59* (17b), *60* (1), *61* (17b), *65* (3), *63a* (14), *63b* (14), *64* (17b), *66* (16), *67* (16), *68* (16), *70* (17b), *72* (16), *73* (16), *74* (17b), *75* (16), *76* (16), *77* (16), *78* (16), *79* (17b), *80* (17b), *82* (16), *83* (16), *84* (16), *85* (17b), *86* (21), *87* (21), *88* (10), *89** (10), *90* (10), *91* (17b), *92* (20), *93* (17b), *94* (17b), *95* (15), *96* (17b), *97* (17b), *98* (19), *99* (17b), *100* (17b), *101* (9), *102* (17b), *103* (17b), *105* (17b), *106* (17b), *107* (5), *108* (5), *109* (6), *110* (5), *111* (5), *104* (17b), *10049* (15), *10164* (17b); *Alejandro, G. J. D. & Castro, J. C. 14** (7), *28** (22), *49** (24); *Allen, M. S. 150272* (17b); *Anonuevo, P. 13516* (23); *A. N. U. 1564* (17c).

Banlugan, G. 72607 (3); *Banzon, R. 128204* (17b); *Bartlett, H. H. 13459* (3), *14653* (17b), *15545* (18); *Bermejor, J. 182* (17b), *350* (17b); *Bhargava, N. 1757* (11c); *Bhern, G. P. 802* (17b); *Bolster, F. H. 136* (17b); *Borden, T. E. 1220* (17b); *Borromeo, H. 25602* (3); *Bourell, M. 2244* (16); *Brenner, L. G. 2584* (17b); *Britton, B. B. 120* (12); *Burley, J. S. 95* (17b), *147* (12).

Caballes, R. A. 98444 (23); *Canicosa, E. 9730* (3), *9765* (17b); *Castro, A. 5782* (17b), *5810* (17b), *5853* (17b); *Celestino, M. 7819* (3), *7879* (6); *Cenabre, A. L. 29149* (17b); *Chang, C. E. 2754* (11c); *Clemens, M. S. 15729* (23), *17011* (14), *17249* (9), *51845* (5); *Conese, E. 15797* (17b); *Conklin & Buwaya 79609* (23), *80640* (5); *Conklin, H. C. & del Rosario* 72628 (3), *72703* (5); *Convocar, P. 2820* (14), *2945* (17b); *Copeland, E. B. 355* (20); *Cordero, P. & Espiritu, R. 91572* (16); *Cuming 918** (3), *1368* (17b); *Curran, H. M. 4517* (17b), *10535* (17b), *17358** (2).

Danao, F. 19907 (17b); *Deguchi, K. et al. 6303* (17b); *del Rosario, R. 79959* (11a); *del Rosario & Corsero 96180* (3); *Delprete, P. 6458* (17b); *Demetrio & Mendoza 36232* (17b); *DeVore & Hoover 172* (17b); *Dias, F. 29885* (2).

Ebalo, L. E. 193 (18), *718* (17b), *67441* (16); *Ebalo, L. E & Conklin, H. C. 1227* (16); *Edaño, G. E. 114* (3), *244* (16), *373* (3), *1312* (17b), *1527* (17b), *3290* (3), *3500* (3), *11074* (17b), *11384* (17c), *11873* (23), *11926* (23), *15450* (17b), *19875* (18), *21782* (17c), *21809* (17c), *37163* (17b), *37164* (17b), *40230* (14), *46114* (12), *46220* (17b), *75879* (17b), *76425* (14), 79448 (11a); *Edaño, G. E. & Gutierrez, H. 37744* (17b), *38555* (17b); *Edaño, G. E. & Ramos, M. 40589* (3); *Elmer, A. D. E 5935** (5), *6195* (9), *6318* (6), *6381* (6), *6536* (5), *6673* (17b), *7045* (17b), *8134* (17b), *8431* (5), *8976* (9), *9154* (3), *9535* (5), *9966* (6), *10121* (17b), *10510** (15), *11291** (20), *11309** (23), *12451** (12), *12792* (17b), *13301* (17b), *13304** (4), *14388* (17b), *17481* (3), *17670* (17b), *21940* (6), *21978** (19); *Escritor, L. 21192* (17b); *Espiritu, R. 91473* (16).

*Fenix, E. 3770** (11a), *15531** (16), *26030* (17b), *29851* (3); *Fosberg, F. R. 35017* (17b), *35018* (17a); *Fox, R. B. 4586* (17b), *9021* (17b), *13354* (16); *Foxworthy, F. W. 605* (17b), *691* (17b), *Frake, C. O. 20332* (17b), *36058* (17b) *38115* (17b); *Frohne, G. M. 35140* (17b).

Gammill, J. A. 261 (17b); *Garcia, F. C. 34977* (5); *Gatchalian, F. 15493* (17b); *Gutierrez, H. G. 77986* (17b); *Gutierrez, Y. & Reynoso 108958* (17b).

Hallier, H. s.n., s.d. (17b).

Ingle, N. R. & Baylomo, R. 630 (15).

Jocano, F. L. 40696 (17b).

Kanehira, R. 2497 (17b); *Kondo, Y. & Edaño, G. 36685* (16).

Loher, A. 1524 (9).

Mabesa, B. 35292 (9); *Mabesa, C. 24876** (17a); *Mabesa, C. & Escasino, J. 98452* (23); *Madulid, D. A.* 6831 (14), *6841* (17b); *Maliwanag, E. 113* (12); *Mangubat, L. 481* (16); *Martelino, A. & Edaño, G. 35331* (17b), *35391* (2); *McGregor, R. C. 131* (12), *10726* (17b), *32449* (12), *32450* (2), *43797* (17b); *Mearns, E. A. 36* (17b), *37* (17b); *Mearns, E. A. & Hutchiuson, W. I. 4716* (17b); *Mendoza, D. R. 2009* (17b), *3126* (17b), *12224* (17b), *18327* (17b), *18350* (17b), *18431* (14), *40936* (5), *42053* (20), *42076* (23), *42193* (17c), *42373* (23), *42398* (17b), *104012* (5); *Merrill, E. D. 299* (3), *413* (17b), *770** (6), *817** (8), *865* (8), *867* (16), *912* (17b), *985* (12), *986* (12), *1341* (17b), *1768* (9), *2508* (3), *2655* (17b), *2890* (17b), *2972* (19), *4072* (12), *4139** (18), *5338* (16), *6681** (9), *9332* (17b), *9496** (21), *10437* (3), *11526* (16); *Meyer, R. 3020* (3).

Ocampo, M. 27899 (12).

Paniza, I. P. 9436 (18); *Pelzer, K. I. 13555* (20); *Perrottet, G. S. s.n.**, s. d. (17b); *Pipoly, R. et al. 37956* (16); *Price, G. R. 509* (17b).

Quisumbing, E. 2045 (17b), *2054* (17b), *2101* (17a), *2193* (5); *Quisumbing, E. & del Rosario, R. 79842* (11a), *79858* (11a), *79792* (17b); *Quisumbing, E. et al. 79364* (11a), *79479* (11a), *79931* (11a).

Ramos, M. 5044 (3), *7254* (9), *14604* (17c), *23585** (14), *23715* (14), *24485* (23), *30262* (14), *30509* (14), *Bureau of Sci. no. 33133** (1), *39509* (3), *39882* (17b), *40955* (12), *42135* (6), *46385* (12), *77006* (14); *Ramos, M. & Convocar, P. 83671* (23); *Ramos, M. & Edaño, G. 26468** (13), *28687* (3), *28783* (3), *29093* (3), *29536* (17b), *29719* (11a), *31382* (2), *33469* (17b), *36596* (20), *37307* (20), *38103* (9), *38134* (9), *39050* (23), *40703* (3), *44543* (17b), *45292* (17b), *45480* (14), *46977* (12), *48089* (17b), *48110* (3), *49315** (17c), *49660* (16), *75143* (14), *75154* (14), *75159* (14), *75259* (14); *Reed, R. 40835* (17b), *40896* (12), *40902* (12), *93778* (3); *Reynoso, E. 87760* (16); *Reynoso, E. et al. 14506* (17b), *17879* (2), *17905* (17b); *Ridsdale, C. E. 35* (8), *1542* (10), *156719* (16), *156781* (21); *Rivera, F. & Duyag, A. 75002* (12); *Robinson, C. B. 6847* (17b).

Sablaya, M. 45 (17b); *Salvoza, F. M. 3214* (17b), *3215* (17a), *3450* (17b); *Santos, J. K. 34* (5), *4094* (20), *5212* (12), *5497* (5), *5678* (9), 31725 (6), *31880* (5); *Sinclair, J. & Edaño, G. E. 9689* (5), *55365* (5); *Soejarto, D. D. & Fernando, O. 7301* (17b); *Soejarto, D. D. & Madulid, D. A. 6144* (16); *Steiner, M. L. 267* (5), *22585* (5), *22830* (17a), *35835* (5), *40038* (17a), *40063* (17b), *41580* (5), *41617* (5), *82016* (17a); *Stern, W. L. 2185* (3); *Sulit, M. D. 3442* (12), *6098* (23), *6125* (17b), *6280* (23), *7087* (3), *7722* (5), *8232* (3), *9747* (17b), *11804* (17b), *12343* (16), *13813* (3), *14366* (23), *14449* (17b), *18877* (12), *21530* (23); *Sulit, M. D. & Conklin, H. C. 16840* (17b), *16875* (17b), *17652* (18).

Taleon, A. T. 33828 (17b); *Topping, D. L. 64* (5).

Valbuena, R. & Lopez, F. 91899 (5); *Vanoverbergh, F. M. 190* (6); *Varadarajan, G. S. 1531* (2); *Velasco, V. 26650* (11a), *24852* (17b); *Velasquez, G. T. s. n.* [1 Dec. 1953] (17b); *Vidal 389* (17b), *801* (3), *1457* (17b).

Walker, E. H. 7456 (17a), *7501* (5); *Wallich 6225** (11c); *Wenzel, C. A. 57* (17b), *179* (17b), *442* (12), *667* (23), *3354* (20); *Whitford, H. N. 388* (17b), *524* (17b); *Williams, R. S. 127* (17b), *1006* (5), *1011* (9), *1588* (9), *2854* (17b).

Zwickey, A. L. 34 (17b), *519* (23).